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XII
No. 10 INDIANA UNIVERSITY BULLETIN SEPTEMBER 1914

INDIANA UNIVERSITY

EXTENSION DIVISION

PROCEEDINGS OF A CONFERENCE ON EDUCATIONAL MEASUREMENTS

Held at Indiana University, Bloomington, Indiana
Friday and Saturday, April 17 and 18, 1914

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Proceedings of a Conference on Educational Measurements

FRIDAY, APRIL 17—MORNING SESSION

[The Conference met in the Auditorium of the Student Building at 10:30 o'clock a. m. It was called to order by Dr. William A. Rawles, who introduced as presiding officer Hon. Charles A. Greathouse, Superintendent of Public Instruction of Indiana.]

THE PRESIDING OFFICER (SUPT. GREATHOUSE): My friends, fellow superintendents, ladies and gentlemen—This is certainly a splendid representative body of schoolmen of Indiana, and I assure you that I am very glad to be present. I believe I can say without the spirit of boasting that we are doing as much educaeationally in Indiana today as is being done in any other state in the Union. I am not unmindful of the honor conferred upon me by the Committee on Arrangements in extending the invitation to preside at the first session of this very important conference, and it is fitting, my friends, that we hold such meetings as these in order to promote the welfare and progress of the public school system.

This is an era of co-operation. In business, in society, and in government there is the spirit and practice of united effort.

The school as a part of the social world is becoming permeated with this spirit of working together, with the result that as never before we are able to establish and maintain standards of efficiency in all departments of school work.

With associations of school men of cities, counties, states, and the Nation, there is an interchange of ideas and a unity of effort which is eliminating errors of individual judgment, confirming or disproving theories based on tradition or prejudice, and stimulating the best efforts in the solution of common problems.

The recent meeting of the State Teachers Association with an enrollment of 6,300 is an evidence of co-operation on the part of Indiana teachers in this direction. With the forces united for efforts toward increased efficiency has come the demand for intelligent direction along the lines of investigation of conditions as they are, and as they should be in the public schools of the State and Nation.

Indiana has long maintained a place of honor among the leaders in the educational activities. Her school system has long been regarded as excellent. Her educators have long been leaders in every forward movement, and the products of her schools have been sought to direct the efforts of many states and communities.

That this has been the case, has in a large measure been due to the fact that her school men have been open-minded students, earnestly seeking the truth, willing to see the truth, and wherever found, to adjust the course and methods to that which was progressive and sound.

This spirit has been fostered largely by the co-operation of schools of all classes, from the district school to the University, and we are here today as another evidence of the fine spirit which throughout the State prevails between the State University and the schools which look to the institution for wise direction and council. The feeling of mutual helpfulness between the school men and the State University has been increasing steadily during the past with the result that today, as never before, the schools of the State are looking to the University for guidance and help.

There is a deep and widespread feeling that the superintendents and the University should be on still closer terms of co-operation for:

(1) The superintendents should come in closer contact with the men who are devoting their lives to the study and teaching of those things which form the basis of all education.

(2) The University professors should gain, through the superintendents, the knowledge of difficulties and the practical problems of the administration of school work.

(3) The superintendents should have more first-hand knowledge of the plans in operation for the preparation of teachers of the special subjects, as furnished by the University.

(4) The University and school men should together plan investigations which may be carried on by the advanced students under the direction of the heads of departments.

(5) The result of these investigations should be made available to students of the School of Education and the superintendents through the University and the Department.

(6) This meeting is an evidence of the interest on the part of school men, and their presence is an expression of their appreciation of the University's efforts to bring about this co-operation.

My friends, Indiana's Constitution of 1850 provides for the general diffusion of learning and knowledge for the safety and perpetuity of a free government, and it further says it shall be the duty of the General Assembly, as soon as circumstances will permit, to provide for a general system of education ascending in regular gradation from township schools to the State University, which shall be equally open to all and where tuition shall be gratis. Thus the pioneer Legislature of Indiana conceived a system of common schools to meet the entire wants of the people, the common schools its base, the State University its apex.

The State University, my friends, was greatly handicapped for a number of years in not having sufficient funds to carry on its work. It became necessary for them to go before the Legislature every two years and persuade and beg them for enough money to meet the actual demands of the institution. The Legislature of 1913 provided for an annual tax of seven cents on every one hundred dollars of taxable property. This means a great deal for the institution. It means that they are able to carry forward the great work which they have done; and the people of Indiana are willing to pay the tax provided they get value received in return for the money expended.

What a splendid spectacle in free government is the cheerful patience and unsurpassed fortitude the masses display in bearing the burden of the school tax. Protest and resistance to other forms of taxation are usual and constant, but seldom are complaints made against taxation for public education. The pessimist may despair of the perpetuity of our free institutions, but that despair will never be realized. Although abuses and evils may come, the people blessed with education, which is the grand work of intelligence in public affairs, will finally right every wrong and cure all evils. Freedom and education go hand in hand. Without the latter the former would perish.

What, then, is the grand essential to the system of free public education? Upon what does it hinge? Splendid institutions may be erected; every art and industry may be called upon to furnish and equip school rooms; millions may be spent to furnish the aid to education, and after all is done it signifies nothing without competent teachers. They are important to the system. It therefore becomes a necessity that the school superintendents of Indiana, both state and county, the officers of Indiana University, and the Department of Public Instruction at Indianapolis, see that every school house in the State has a competent and qualified teacher. Therefore, it is important that we hold these meetings here at Indiana University. It means a great movement forward to the school system of this State. It means more energy and greater efficiency in the teaching force; and we all join with the Department of Public Instruction at Indianapolis in the one great purpose of advancing the cause of education among all the people of this State.

Now, my friends, the gentleman who is to address you this morning needs no introduction from me. He is well and favorably known to you. In my judgment, he is the greatest University President in this country. *(Applause.)* In the judgment of those who are capable to pass upon it, he is one of the great University Presidents of America. I take pleasure in presenting Dr. William Lowe Bryan. *(Applause.)*

COMMON SENSE AND SCIENCE IN EDUCATION

DR. BRYAN: Mr. Chairman, ladies and gentlemen—I wish first of all on behalf of the University, to bid you a hearty welcome. We are rejoiced to see so many of the representative school men and women of Indiana here today. I think I shall not be out of place if I say that we are happy to greet a great many more of you than we had reason to expect, and I trust you will be able to find satisfactory accomodations in our little place.

There are many historical answers to the question how shall we find out what we need to know in order to act successfully. For example, the answers of common sense, of exact science, of systematic philosophy, of systematic theology, of mysticism, there being specific varieties of answers under each of these general types. In many cases a man who makes one of these answers is hostile to all the others. A typical example of this hostility is that often found in the man who professes to represent common sense as against science. We have literary examples of this hostility in Aristophanes's Clouds and in Swift's Island of Laputa. We have a striking illustration in the hostility of the late Mr. Crane, manufacturer of elevators, to the technical schools and technical science. We have illustrations in the distrust which many farmers have to the agricultural expert, and which some of our people have shown toward the advice of experts in regard to our water supply, or in regard to our public highways.

In Germany more than in any other country we have an illustration of the combination of science and common sense in their application to agriculture, road making, sanitation, and all other questions of public concern. When we contrast the wisdom and economy of Germany with the unwisdom and waste of our country, we see the justification for David Goss's characterization of America as the Land of Waste. However, there are many evidences that our people are changing rapidly toward a recognition of the value of science in its relation to the food supply, the fuel supply, the public health, etc. Our people are gradually coming to realize that we are compelled to call upon the scientist and to follow his instructions in order to live.

In the field of Education we have had the same distrust of the scholar. Not infrequently the school man has the belief that systematic study in a university will lead him away from the practical problems with which he has to deal. Many of our best young schoolmen have come to realize, however, that in Education also we must call upon the scholar. Many of the scholarly studies are in appearance and in fact remote from the immediate problems which confront the school superintendent. However, one sees on full consideration that the scientific studies of Education make part of a larger view which is necessary for the adequate solution of our educational problems. I counsel the young school man, therefore, to go away from the school and to devote himself for a number of years to thoroughgoing scientific study under the direction of the greatest scholars, whether he can see the immediate application of those studies or not, and I assure him that if he does this with intelligence the time will come when he will be able to deal with educational problems, great and small, upon a far higher level.

I congratulate you today upon the fact that you are to hear one of the most notable contributors to the scientific study of Education, Professor Thorndike, Professor of Educational Psychology, Teachers' College, Columbia University.

MEANS OF INCREASING EFFICIENCY IN ARITHMETIC

DR. THORNDIKE: Fellow teachers, and students of Education—It gives me, as I think you all must know, very great pleasure to be in this State and at this University. In the fifteen years that I have been at Teachers' College there has been a steady stream of educational wisdom and intellect coming there from Indiana. I do not suppose that I should have worked as a worker in the science of Education but for the constant support that I have received from the State of Indiana during the past fifteen years! There are of course, other states, but it is not necessary at this time and place to say anything about them. *(Laughter.)* Thanks to Indiana, I am alive and working in educational science and educational measurements.

I presume that almost everything that I shall have to say will seem to you, as it appears to me now, after what President Bryan has been saying, a little humdrum. Science, as you look at it from the outside, can be idealized. We can think of it as going from the crudities of convenience, of mere custom and tradition and blindness, out into a world of light, out where things are clear and sharp, where we make great strides of progress; but in fact, science to the worker is, I suppose, a more or less humdrum thing, like teaching is to the class teacher and like farming is to the farmer. It is the day's work. We gain a little here and we lose a little there. We climb up by inches; we are glad when we do not fall back.

I certainly have no brilliant theories, no sparkling prophecies or declarations to make. Applied psychology, in the case of teaching, is a sort of human engineering. We try to build up intellect and character and skill as a person builds up a bridge, or as a farmer builds up the fruit on the tree. We try not to waste anything. We try to utilize all the materials, to save our time, and to get the best results we can for the effort and the money. We try to do all this with the aid of that exact knowledge which we call science. There is nothing that happens marvelously. The worker in educational science does not wake up in the morning to find that the rather mediocre intellect of youth which repels information like the man that President Bryan spoke of, has blossomed out over night, by some sort of hocus-pocus of psychology, into a marvelous genius that learns everything it ought to learn.

Plato said the better part of the soul was that which dealt with quantities and measurement. If you get a thing down to quantity and measure, you have it exactly defined—you know where you are. The statisticians often lie, but statistics rarely do. Scientists undoubtedly often deceive, but actual measured facts somehow do not deceive; and it has been my experience all these years that in every field, with every person, there is this gain that President Bryan has so well described.

It was originally planned that there should be, before these words of mine, some discussion of the results of measurements of achievement in arithmetic. Many of you in this room have come here because you have been interested in giving Mr. Courtis's tests in your classes in arithmetic, in getting a cross-section of the achievement of your schools in that work; and I thought it would be interesting to follow this discussion of what the schools were getting by some suggestion as to means by which we might get more.

After we have measured what we have got, our use of these measurements will be, at least in one direction, to try to get guidance as to getting a better and larger educational product. In so far as I have time I wish to speak concerning four lines of advance in educational science which seem to me to give prospect of increasing efficiency in our instruction of arithmetic. The first concerns certain considerations from general psychology. The second concerns some results from experiments that we have been making in the last three or four years with practice drills in fundamental work in arithmetic. The third takes up the questions of mechanical alterations in the form of textbooks and other such aids—a pure engineering problem in Education. The last takes up the consideration of the language element in arithmetic from the modern point of view of habit formation.

I probably shall not get through all these, and I shall not try to be continuous, or to make anything in the nature of a smooth or fluent address upon them. It is the facts themselves that are of interest, not anything in the way the message is brought.

First, then, some considerations about the general science of the psychology of arithmetic, the nature of the learning process in the case of boys and girls with the study.

The traditional account of the psychology of arithmetic, to which we were all brought up, is that we form, first, certain notions of the numbers one, two, three, etc., up to ten, by abstracting from their concrete connections or embodiments. In the second place, we learn by memory certain facts about them, that two plus two equal four, that two plus four equal six, that eight less four equals four, that three times seven is twenty-one, and so on, learning the multiplication table, the addition and subtraction table, and the multiplications to nine times nine, and the divisions to eighty-one divided by nine. In the third place, the traditional view is that we learn by memory or by deductive reasoning to manipulate these simple facts so as to read, subtract, multiply, and divide with large numbers, addition in 'teens, column addition, carrying, long division, and long multiplication, and the like; and in the same way, either by memory, as a matter of mechanism, or by deductive reasoning, we learn to manage the manipulations of fractions and denominate numbers; and, in the last place, we apply these arithmetical manipulations to various problems of reasoning.

This traditional account is to my mind superficial and perhaps actually misleading, and I wish to present some rather radical alterations in it for your consideration. The first is a question concerning the role of the general laws of mere habit formation, mere association or connection in the mind in the acquisition of arithmetical knowledge and power. By these laws of association or connection, or habit formation, I mean the simple fact that if you get a person to respond to a certain situation which we will call 'A,' by a certain response which we will call 'Alpha,' that 'Alpha' tends thereafter to be hooked up with, hitched to, 'A;' and 'A' tends to produce or evoke, bring, effect, connect with or lead up to 'Alpha.' The oftener you do that the more it so tends. In the second place, the balance of satisfyingness that attends that connection is a second determiner of its extent. If 'A' leads to 'Alpha' with a great deal of comfort or joy or good feeling on the part of the person concerned, then the connection between 'A' and 'Alpha' becomes strong. If it leads to discomfort and misery on the part of the person, then the A-Alpha connection becomes weak. If we reach out to get a piece of candy and put it in our mouths, we, as a general rule will reach out again for the same purpose; but if we reach out and touch a red-hot stove we do not reach out again. These are perfectly simple laws. They result in equally simple recommendations, namely: Put together those things that you wish to have go together. Associate satisfaction and comfort to the creature with those connections which you wish to make.

Now our problem concerns the role of the general laws of association in the acquisition of arithmetical knowledge and power. Their importance has certainly been enormously underestimated by the majority of teachers and writers of textbooks in the past. Consider, in the first place, that mastery by deductive reasoning of such matters as 'carrying' in addition, 'borrowing' in subtraction, the value of the digits in partial products in multiplication, the manipulation of figures in division, the placing of the decimal point after multiplication or division with decimals, or the manipulation of the figures in the multiplication and division of fractions is impossible, or extremely unlikely, in the case of children of the ages and experience in question. It is substantially impossible with all save the very brightest, probably the brightest tenth. You know from your experience that such children do not as a rule deduce the method of manipulating figures from their knowledge of decimal notation. Whatever the books say, or whatever you say, they learn what decimal notation is from their experience that multiplying with large numbers gives long answers that the teacher calls right, and short answers that the teacher calls wrong. Their experience is that when you have to carry you add something, when you borrow you have to supply something. They learn the method of manipulating numbers by seeing them employed, and by more or less blindly acquiring them as associative habits.

Consider in the second place that we, who have already formed and long used the right habits, say for fifteen years, and are therefore protected against the casual misleadings of unfortunate mental connections, can hardly in ourselves realize the force and power of mere association. For example, when a child writes sixteen as sixty-one—the six first and the one second—we are tempted to think that he is in some way insane or perverse. When a child has to add, say fifteen and nineteen, and gives us the answer two hundred and fourteen, adding nine and five and writing fourteen, and adding one and one and writing down the two, again we are tempted to think of him as in some mild way insane or perverse. When a child is asked to multiply thirty-six by twenty-seven and gives as an answer, we will say, six hundred and forty-two, multiplying the six by seven which gives forty-two, and multiplying the three by two which gives six, and puts down six hundred and forty-two, we think of him as an aberrant creature, a creature who is somehow violating the laws of thought. We perhaps have never understood that that child goes wrong for exactly the same reason that we go right, namely: the force and power of association. If we take the case of a person writing sixty-one when he is asked to write sixteen, we find it occurring in the work of pupils who have been drilled in writing twenty-six, thirty-six, forty-six, sixty-two, and then going back to 'teen numbers. In writing twenty-six, thirty-six, forty-six, and like numbers, of course, the order of writing is the order of reading. You read twenty-six; you write twenty-six. You read sixty-two; you write sixty-two. You say to the child 'Write sixteen,' and what is more natural than that he should write down six, and something or other to stand for the 'teen. He is not doing anything perverse. He is doing simply what the law of habit in that case directs. He takes the order of speech for the order of writing, as he has done before. If our language said onety-one for eleven, and onety-six for sixteen, and onety-three for thirteen, this mistake would probably never occur except as a real insanity, or lapse, or as the result of misconception or lack of memory; and the mistake would then be more frequent before the twenty, thirty, forty numbers were learned, instead of being more frequent after.

Again, when children are given much drill on written column addition involving the higher decades, each time writing, of course, the two-figure sum, they are forming a habit of writing twenty-eight after the sum of eight, six, nine and five is reached, and it should not surprise us if the pupil still occasionally writes the two-figure sum for the first column, though a second column is to be added also. On the contrary, unless some counter force influences him, he is absolutely sure to make this mistake. We must simply expect that when they come to addition with 'carrying' there will be a certain percentage of them that will tend, as they get the first column footed up, the answer being fourteen, say, to write that fourteen down as they have done in adding single columns. They are not possessed of any marvelous intellectual sagacity which goes ahead of the course of their short lives to forewarn them of the fact that now you have a totally new thing, 'carrying,' which is to be brought in as a new element and process; and it is we, not they, who would be perverse and eccentric if we should expect that.

In connection with the third mistake I mentioned of multiplying thirty-six by twenty-seven and getting for the answer six hundred and forty-two by multiplying merely the single numbers, you have a chance for a very pretty and instructive experiment which I advise every person here to make.

Take a class who have never had yet any long multiplication and give them a set of examples where two three-place numbers are to be multiplied, or even two four-place numbers; have the two three-place numbers or the two four-place numbers printed out on a sheet with 'multiply' in very large letters at the top. On the one hand you have whatever associations, whatever has gone with the word 'multiply.' That is one force acting on the childish mind. On the other hand, you have called for whatever force habit has associated with the sight of two four-place numbers. Now think for a moment what mere association, mere habit-connection, will have put with that word 'multiply' on the one hand, and the sight of the two four-place numbers on the other. Well, your answers, if we took the time to collect them from the room, would probably represent about the things you do get. Some will do nothing.

Many children will subtract. The habit connections of the two long numbers with subtraction are potent, and the child subtracts, if the lower number is the smaller. If the lower number is the larger he is balked in the subtraction habit. It would take probably much courage and coercion to make a child subtract the upper from the lower. If you could get from your pupils a definition of subtraction, most of them would say that subtraction is where you do something to the bottom number you do not do to the upper. You would find that taking the bottom number from the upper is one of the most prominent elements in children's thought. Some of the children will multiply as far as they can. Some will multiply the upper number by one or more figures of the lower number. All will exemplify the action of the law of association. They do what they have done in the situations most like the present. Since they have rarely added, never multiplied or divided, and have often subtracted with two three-place numbers, some will be led by habit to neglect the request to multiply. Since they have multiplied seven by six, getting forty-two, and three by two, getting six, and four by five, getting twenty, some will write as an answer to four hundred and thirty-seven multiplied by five hundred and twenty-six, twenty thousand six hundred and forty-two. Some will multiply the four hundred and thirty-seven by six and then stop; some will multiply it by five and then stop; while some will respond to the novelty of the situation by an 'I don't know,' or 'I can't.' It is with or against the force of such habits as this that the new habits of long multiplication are formed.

There is one other mistake that I was going to talk about—the mistake of a child answering that four divided by one-fourth equals one. We have in our arithmetics, many of us—I plead guilty myself in years past—taught our classes elaborate explanations of why you should invert and multiply, or in the more fashionable modern phrase, which means exactly the same thing, why you should multiply by the reciprocal in dividing by fractions. Very great pains are taken and the process of division by fractions is approached with consummate care. From a long way off you can see the textbook, or the model school teacher, fixing the eye on this tremenduously difficult thing of division by fractions, and making these elaborate preparations in the way of all sorts of devices to get out of the difficulty.

Now, was the difficulty at all that the child felt any rational objection to inverting and multiplying? On the contrary, I feel sure that most children in the fourth and fifth grades would invert seven times over and multiply and divide six times apiece quite cheerfully and readily or cancel numbers at random in a column, if they were shown how to do so. It is not that they feel the least rational objection to inverting and multiplying. Consider the simple matter of habit. What has gone with dividing in the child's experience, say, in making four thousand divisions? The one thing has been that when you divide, the answer is smaller than the number that you divided. In all his previous work with division the one constant element has been that division has meant a smaller number. To the child this is the one prominent feature connected therewith. Now, take a problem like four divided by one-fourth, and give the answer sixteen. That seems to him preposterous. 'Divide four by something and get sixteen—ridiculous! You cannot go up in the air that way. When you divide, the answer is smaller than the number that you divided. It never has been larger before.' That is his inner attitude.

If you yourselves would tell me honestly what you think when I say that four divided by one-fourth is sixteen, one out of four of you would tell me that you don't feel that it is quite right. Some of you will probably confess even now that you feel a slight irritation or doubt in saying or writing that four divided by one-fourth is sixteen. It is the case with even a rational group like this, that there is not more than one person out of four who does not to this day feel a certain irritation, a certain immorality, a certain impropriety, in dividing four by one-fourth and getting sixteen; in dividing four by one-eighth and getting thirty-two! Certainly it does not seem right to the fourth or fifth grade child, who is required to reverse his habits in this, to him, preposterous way.

I will stop here for a moment to give one illustration of constructive work that may come from our psychology here. If the difficulty in division by fractions is due to habit, then we will find that the way to overcome that habit is by another habit. The best way to controvert an unfortunate habit is not by rational explanation, but by building up the other habit.

I am sorry I haven't a blackboard here, but perhaps I can get along without it.

The children having this habit that division is to make smaller, we want to break that habit up in the case of division by fractions. We write out in good clear large letters certain rules:

When you divide by any number larger than one, your answer is smaller than the number divided. When you divide by one, your answer is the same as the number divided.

When you divide by any quantity smaller than one, your answer will be larger than the number divided.

Then give drills with sums like: $16 \div 8 = 2$; $16 \div 4 = 4$; $16 \div 2 = 8$; $16 \div 1 = 16$; $16 \div \frac{1}{2} = 32$; $16 \div \frac{1}{4} = 64$; etc.

The children have got the habit of running down in this eight, four, two, one, order; and up in this two, four, eight, sixteen, order. As a result, the natural thing for them to say is, sixteen divided by one-half is—not eight as it would have been if you hadn't started in this way—but it is some number larger than sixteen; and so when it comes to sixteen divided by one-half, the bright child will have a fair chance at thirty-two. Then give them sixteen divided by one-fourth, and keep them going on up as far as is suitable. Give similarly series where you divide twelve by six, four, three, two, one, one-half, one-third, one-fourth, and so on. Kill the undesirable habit with a habit. The difficulty of dividing by fractions is the custom of excepting division to result in a smaller number, and the cure for it is to build up a contrary habit. You can do it with a little wisdom and efficiency in something like thirty-five minutes.

I could go on with illustrations like this, but time will not allow, and they are not, for this audience, necessary. The fact is that the learner in arithmetic rarely can, and almost never does, survey and analyze an arithmetical situation and justify what he is going to do by articulate deductions from principles. He usually feels the situation more or less vaguely and responds to it as he has responded to it, or some situation like it, in the past. Arithmetic is, to him, not a logical doctrine which he applies to various special instances, but it is a set of rather specialized habits of behavior toward certain sorts of quantities and relations. And in so far as he does come to know the doctrine, it is chiefly by doing the will of his arithmetical teacher. This is true even with the clearest expositions, the wisest use of objective aids, and full encouragement of originality on the pupil's part.

Working with quantities and relations that are partly understood only, or even misunderstood, in this habit-formation way, does, under the right conditions eventually give rational control over them. The old concept was that if you taught people mechanically, they would never come to see through the matter. They were to be taught the deductive explanation even if they never used it. The rule was: 'Make sure first that your children understand each process; that they see through it; that they can give the analysis and think it out. Then let them forget it and actually do their arithmetic by blind habit.' On the contrary, I submit to you that all the reasoning that we ever have is the organization, the up-building, of our habits; that if we form the right habits, out of them will grow eventually this comprehension of the principles. Is it not the general process, as we find in learning, to respond as well as we can by habit, to get by so responding a little clearer idea of the problem, and respond a little better the next time, and so on?

For example, does not the pupil in arithmetic, by mere habit, have some notion of what one-fifth means? He has had something like one and something like five at the beginning. His notion depends on whatever that past experience is. He answers the question, 'One-fifth of ten equals what?' When he says 'three' the teacher smiles. When he says 'two' she more or less compliments him. When he says 'fifty' the teacher looks shocked. The bright little girl, the keenest in the class, says one-fifth of five is one; one-fifth of twenty is four. The pupil feels when he is right or wrong in this case from the surroundings. They give him a better idea of one-fifth. Then he goes on, to one-fifth equals how many tenths, or how many twentieths, and his power enlarges. He revises his concept of the unit fractions in that way, and then he comes to add one-fifth to two-fifths. That gives him a little better comprehension of what one-fifth really is; and so on until he comes to a full and adequate notion of the fraction, as contrasted with the integral number. What begins as a blind habit of manipulation, started by imitation, may thus grow into the power of correct response to the essential element. The pupil who has at the start no notion at all of 'multiplying' may learn what multiplying is by his experience that one multiplied by four gives you four; that five multiplied by forty gives you two hundred; that five multiplied by four hundred gives you two thousand. Out of such experiences he gets the notion of multiplication itself. If the pupil keeps on doing something with numbers and differentiates right results from wrong, he will very often reach in the end the abstractions which he is supposed to need in the beginning. It may even be that in many cases for many pupils this is the more economical way.

So far, I have discussed only the work of association. That does not mean that in the least I deprecate or disbelieve in pure reasoning in arithmetic. On the contrary, I believe that not only can arithmetic be used as a means for the cultivation of reasoning, but it can be so used not only with the brightest pupils, as at present is commonly the case, but also with a very large fraction of the class.

Let us make a distinction between deductive reasoning from the principles of decimal notation to the methods of manipulation in pure arithmetic, and on the other hand, inductive reasoning, inductive understanding. The common explanation is that these methods of manipulation, if understood at all, are understood as deductions from the properties of our system of decimal notation. The explanation which I offer is that they are understood as inductions from the experiences that certain methods of manipulating numbers always give the right answer. The first explanation leads to the common preliminary deductive explanations of the textbooks on arithmetic as we know them, especially the older ones. The other leads to explanations by verification.

For example, we would not explain to the child why seven and four give eleven. We would have him learn that mechanically, and verify it by counting up to eleven, and have him see that whatever we told him to do in addition, and whatever he had mechanically learned by imitation, that he would find to be safe and sure by verifying it from counting. Again, we would have him verify the subtractions both by counting objectively, and also by adding. He would learn that eleven less four gives seven, because he would have the problem, seven and what make eleven? You say seven and five? No, he knows seven and five make twelve. You say three? No, that makes ten. You say seven and four? Yes, he knows that seven and four do make eleven. He verifies his subtraction by addition.

In multiplication we would not explain the 'times' relation to him by any elaborate deductions from the meaning of numbers, but would simply have him learn that when he multiplies four times seven he gets twenty-eight, gets the answer which he would get by adding. Then he knows how to add and verify his short multiplications by addition. Again, division can be verified by multiplication. The child knows four times seven is twenty-eight. When asked how many times seven goes into twenty-eight he can check his judgment.

As to the scorn some people have for verification by the teacher's 'That is right,' and 'That is wrong,'—if all the arithmetical knowledge which was acquired, not in obedience to any rational insight but in simply obedience to the teacher's statement that that is right, and that that is wrong, was subtracted, my impression is that there would be a gap in the arithmetical knowledge of this country which very likely it would take a decade to fill. A pupil gains a great deal by watching the teacher; seeing what she will 'stand for' and what she will not 'stand for.' This sort of verification represents, after all, what is not so far from science, and from the childish point of view it is certainly common sense.

Let us take this matter of inductive learning or learning by verification up a little more critically. Here, as usual, crucial experiments are lacking, but there are several lines of well attested evidence. First of all, there can be no doubt that the great majority of pupils learn these manipulations (from the placing of units under units, tens under tens, etc., in adding, to the placing of the decimal point in division with decimals) by imitation and blind following of specific instructions, and that a very large proportion of the pupils do not to the end, that is to the fifth school year, understand them as necessary deductions from decimal notation. It also seems probable that this proportion would not be much reduced no matter how ingeniously and carefully the deductions were explained by textbooks and teachers. Evidence of this fact will appear abundantly to anyone who will observe school-room life. It also appears in the fact that after the properties of decimal notation have been thus used again and again, for example, for deducing 'carrying' in addition, 'borrowing' in subtraction, 'carrying' in multiplication, the value of the digits in the partial products, the value of each remainder in short division, the value of the quotient figures in division, the addition, subtraction, multiplication and division of United States money, and the placing of the decimal point in multiplication with decimals, still no competent teacher dares to rely upon the pupil, even though he now has four or more years' experience with decimal notation, to deduce the placing of the decimal point in division with decimals. It may be an illusion, but one seems to sense in the better texbooks a recognition of the futility of the attempt to secure deductive derivations of those manipulations. I refer to the brevity of the explanations and their insertion in such a form that they will influence the pupil's thinking as little as possible!

At any rate, the fact is sure that most pupils do not learn these manipulations by deductive reasoning.

It is a common opinion that the only alternative is knowing them by rote. This, of course, is one common alternative; but the other explanation suggests that understanding the manipulations by inductive reasoning from their consequences is another and an important alternative. The manipulations of 'long' multiplication, for instance, learned by imitation or mechanical drill, are found to give for twenty-five times 'A,' a result about twice as large as for thirteen times 'A'; for thirty-eight or thirty-nine times 'A,' a result about three times as large; for one hundred and fifteen times 'A,' a result about ten times as large as for eleven times 'A,' etc. With even the very dull pupils, the procedure in verified at least to the extent that it gives a result which the scientific expert in the case, that is, the teacher, calls right. With even the very bright pupils, who can appreciate the relation of the procedure to decimal notation, this relation may be used, not as the sole deduction of the procedure beforehand, but as one partial means of verifying it afterward. Or, there may be the condition of half-appreciation of the relation in which the pupil uses knowledge of the decimal notation to convince himself that the procedure *does*, but not that it *must* give the right answer, the answer being 'right' because the teacher, the answer-list, and collateral evidence, assures him of it.

I have taken the manipulation of the partial products as an illustration because it is one of the least favored cases for the explanation I am presenting. If we take the first case where a manipulation may be deduced from decimal notation, known merely by rote, or verified inductively, namely, the addition of two-place numbers, it seems sure that the mental processes just described are almost the universal rule.

Surely in our schools at present children add the three of twenty-three to the three of fifty-three and the two of twenty-three to the five of fifty-three at the start, in nine cases out of ten, because they see the teacher do so and are told to do so. They are protected from adding three plus three plus two plus five, not by any deduction of any sort, but first, because they do not know how to add eight and five; second, because they have been taught the habit of adding figures that stand one above the other, or with a plus between them; and third, because they are shown or told what they are to do. They are protected from adding three plus five and two plus three, again, by no deductive reasoning, but for the second and third reasons just given In nine cases out of ten they do not even think of the possibility of adding in any other way than the 'three plus three, two plus five' way, much less do they select that way on account of the fact that fifty-three equals fifty plus three, and twenty-three equals twenty plus three; that fifty plus twenty equals seventy, and that three plus three equals six, and that (a+b) plus (c+d) equals (a+c) plus (b+d).

Just as surely, all but the very dullest twentieth or so of children come in the end to something more than rote knowledge—to understand, to know, that the procedure in question is right. If another child insisted that fifty-three and twenty-three added gave thirteen, or fifty-eight, or eighty-five, or five and eight, or eight and five, or seven and six, they would deny his assertion and often support their own. Whether they know *why* seventy-six is right depends upon what is meant by 'why.' If it means that seventy-six is the result which competent people agree upon, they do. If it means that seventy-six is the result which would come from accurate counting, they perhaps know why as well as they would have, had they been given full explanations of the relation of the procedure in two-place addition to decimal notation. If 'why' means because fifty-three equals fifty plus three, twenty-three equals twenty plus three, fifty plus twenty equals seventy, and (a+b) plus (c+d) equals (a+c) plus (b+d), they do not. Nor, I am tempted to add, would most of them by any sort of teaching whatever.

Does that mean that the child is not to reason? On the contrary, I conclude that the giving up of the hopeless quest of this high-flown intellectual sort of reasoning probably provides him with a better sort. What is the real scientific reason why you do put the partial products as you do in multiplication? What is the real reason why you place the decimal point as you do in division? The real reason is that it gives the right answer. I know of no scientific reason for any of the stock manipulations of ordinary pure arithmetic save this. The man who invented them did not invent them by elaborate deductions. He found them first as a short, pretty, easy, way to get the right answer. What is arithmetic for? It might be to discipline the mind in a painful and intricate way, but in point of fact the people who got it up did not get it up for that purpose. Arithmetic is a quick means of getting the right answer; and that pupil who reasons out that what he has done is right because he gets the answer the teacher accepts, or that is in the back of the book, is as rational a person as I wish to number among my acquaintances. The teacher who in brave enough to say, 'Why do you do it? You do it because it gives the right answer,'—that teacher is taking an entirely defensible course. Arithmetic is not merely a deductive science.

It is an inductive science. We learn by trial and error. The justification for the process is often that it produces a certain result. We find the thing is right, not before but after, because it gives the correct, efficient, product.

This is the point of view, I am sure, of the majority of learners of arithmetic. At one extreme is a gifted group, for whom arithmetic is deductive. At the other extreme there is a stupid, dull group, for whom it is mechanical. In between there is the great majority, for whom arithmetic is an inductive science.

I conclude therefore, that school children may, and do, reason about and understand the manipulations of numbers in this inductive, verifying way, without being able to, or at least without, under present conditions, finding it profitable to, derive them deductively.

I have used up all my time, on my first topic, as I was afraid I would do. I do not feel very badly about it, because, after all, it is the spirit and nature of the point of view that you are primarily interested it.

I want still three minutes of your time to give you one illustration in connection with the scientific handling of the language problem in arithmetic. You all know that this is a problem. Ask a child, 'If you should have one apple, and a girl should give you one more, how many apples would you have?' You all know when the child fails with that problem, he does not fail because he does not know the arithmetic of one and one; it is because he doesn't know 'if,' 'should,' 'how many' and 'would.' Again, when a child fails in this problem: 'If you didn't go to school on Monday and Friday, how many days were you absent that week?' that does not mean that the child does not know that two from five leaves three. It means that he does not know 'absent,' 'how many,' 'days.' Again, take this charming problem: 'It takes five days to go to California. When we have traveled three days, how many days have we to travel?' That is on page fifteen in a beginner's arithemetic book. Of course, the arithmetic of the problem is, 'five less three is how many?' The child in seventy per cent of the cases will fail on that problem for non-arithmetical reasons. His failure has to do with 'California,' 'it takes so many days,' 'when we have traveled so many,' 'how many,' and so on.

Unless a teacher has actually measured the abilities of children and inventoried their knowledge of words and word-relations, he is likely to be misled in two ways: He will count on the presence of knowledge that is not present and should not be; and he will fail to provide certain knowledge of words that must be present for efficient work in arithmetic.

I am going to read to you some illustrations which I read at the Richmond meeting, of the first misuse of language, by quoting from a list of words, all of which occur within the first fifty pages of one or more of four elementary arithmetics intended to be read by children in the third grade, even in some cases earlier. For example, the words beginning with 'C' are: Cabbage, California, camped, camphor, candles, cardboard, carriage, charity, Clara, Charlotte, Carrie's, circus, circumference, closet, cloudy, clothes-pin, cocoa, collected, combinations, committee, covered, county, cradles, crane, cranberries, crew, crumbs, currants.

Or consider this galaxy of proper names which appear in one or more of the four books from page 1 to page 50: Adele, Albert, Alice, Annie, Arthur, Bertie, Byron, Charles, Charlie, Clara, David, Dorothy, Edith, Edward, Ella, Ellen, Emma, Esther, Ethel, Fanny, Frank, Fred, George, Gertrude, Gilbert, Grace, Harold, Harry, Helen, Henry, Horace Mann, Jane, James, Jamie, John, Johnnie, Johnny, Kate, Katherine, Lottie, Louis, Louise, Lucy, Lulu, Mable, Mary, Margaret, May, Maud, Morton, Ned, Nellie, Peter, Rachel, Ralph, Robert, Roger, Rose, Ruth, Samuel, Sarah, Stephen, Susan, Susie, Thomas, Tom, Walter, Will, Willie, William.

Consider on the other hand such absolutely necessary words as 'sum,' 'difference,' 'equal,' 'all,' 'part,' 'whole,' 'in all,' and the like. The existence and sure action of connections between these words and their meanings must precede, or accompany, early work in arithmetic, if it is to be efficient; yet few books or courses of study in arithmetic provide for their formation, save hit-or-miss; and surely the primers and first and second readers do not. The four books in arithmetic which I examined actually avoid forming these bonds. The word 'difference,' for example, occurs only once in twenty pages, the pupils' time being spent in getting acquainted with 'dairyman,' 'depot,' 'David,' 'department,' 'Dorothy,' 'discharged,' 'dish-water,' and the like. Two of the four do not use the word 'sum' in these fifty pages, yet find room for 'Samuel,' 'Susan,' 'Susie,' 'swimming,' 'syllable,' 'syrup,' 'soldiers,' 'sparrows,' 'strips,' 'stripes,' and so on.

Bear in mind that the textbook writers who thus leave unformed important facilitating connections and burden the beginnings of arithmetic with the task of learning to read the names of rare food-products, strange vehicles, and the Adele-Byron-Dorothy-Esther series, are from our best; and that without such a deliberate warning to consider the place of every connection in the hierarchy as I have given, not one of us would have done better. Bear in mind also that text books in elementary geography show a similar state of affairs.

What does all this mean from the point of view of increasing efficiency? It means simply that if you are interested in efficiency in arithmetic, you must be careful not to make it hang on irrelevant matters—not on the word 'cabbage,' not on the words 'California,' 'currants,' 'crane,' 'company.' You must, in the case of every situation, separate out the arithmetical difficulty from linguistic or structural difficulties. Try to analyze the issue in the situation concerned. Arrange the issue or problem so that it can be solved by a right organization of the habits which the child has; or provide for the formation, then and there, of the habits which he needs. Some of these habits or knowledge-bonds concern numbers and number-relations; some of them concern words and word-relations. Provide for all.

I have tried to show that arithmetical thinking is nothing mystical, but a process of efficient use of associative habits. We can direct and improve this process just as truly as we can direct and improve the process of building a bridge, or of growing corn. The task is harder, but it is also more interesting. I hope that this task of increasing efficiency in arithmetic may have still more interest for you as you go back to it. And I thank you for the interest you have shown this morning. (*Applause.*)

FRIDAY, APRIL 17—AFTERNOON SESSION

[At 1:30, at the Central School Building, Professor Thorndike gave a demonstration of his method of giving tests in reading. Three sections of seventh grade children were used. The following tests were distributed to the children and marked as directed. The time for each child was marked on the test when it was handed to the teacher in charge.]

I

Write the letter c under every word that means a color. Write the letter m under every word that means a thing that makes music. Write the letter w under every word that means some thing that boys or girls wear. Write the letter d under every word that means some thing that a boy can do.

Remember—c, for colors
m, for things that make music
w, for things to wear
d, for things boys can do

red, green, guitar, hat, coat, run, work, play, shoe, jump, hide, piano, pink, cuff, shout, study, organ, reach, yellow, grasp, scream, collar, request, shiver, crawl, shirt, violin, violet, disagree, purple, inquire, request, scarlet, harp, flute, trumpet, practice, ramble, crimson, cornet, apron, mandolin, trespass, prevaricate, sweater, confess, ribbons.

II

Write the letter a under every word that is the name of an animal. Write the letter t under every word that means a kind of tree or wood. Write the letter b under every word that means some kind of book. Write the letter g under every word that means some kind of a game.

Remember—a, for animals
t, for tree
b, for books
g, for games

lion, tiger, pine, bible, oak. base-ball, primer, tag, deer, maple, snake, elm, willow, walrus, leopard, jack-straws, birch, tennis, giraffe, hickory, elephant, kangaroo, dictionary, dominoes, hemlock, croquet, gorilla, golf, novel, mahogany, walnut, encyclopedia, ledger, rhinoceros, parchesi, cypress.

III

Write a letter g under every word that means something good for a boy or a girl to be. Write a letter b under every word that means something bad to be. Write a letter s under every word that means something to do with school. Write a letter t under every word like 'now' or 'when' or 'before' that means something to do with time.

Remember—g, for good things
b, for bad things
s, for words about school
t, for words about time

liar, fair, lesson, then, lazy, steal, teacher, honest, clean, kind, never, writing, sneak, reading, polite, before, useful, stingy, murder, spelling, arithmetic, cowardly, cruel, afterward, whenever, truthful, modest, upright, geography, graduate, recess, rascal, drunkard, obliging, later, deceitful, during, scoundrel, promotion, grade, generous, criminal, torture, loyal, history, miser, reprobate, earlier, courteous, penmanship, merciful, forger, courageous, craven, renegade, poltroon, reasonable, examination, considerate, deportment, discipline, defaulter, equitable, sycophant, preceding, philanthropic, hitherto, grammar, etymology, pretentious, courteous.

IV

Write a letter n under every word that means some boy's name. Write a letter a under every word that means some animal. Write a letter f under every word that means some flower. Write a letter w under every word like 'lawyer' or 'engineer' or 'salesman' that tells what a man's work or occupation is.

Remember—n, for boy's names
a, for animals
f, for flowers
w, for occupations

John Dick Cat Dog Doctor Rose Teacher Horse Baker Wolf
Daisy Lily Fred Farmer Monkey Violet Bear Grocer Tom
Elephant Butter-cup William Peter George Camel Clover
Samuel Pansy Blacksmith Tulip Carpenter Paul Edward Mason
Painter Leopard Lilac Tailor Banker Michael Raccoon Crocus
Geranium Hiram Plumber Lizard Hyacinth Reuben Claude
Giraffe Lynx Chrysanthemum Joshua Druggist Peddler Begonia
Zebra Fuchsia Nathaniel Wheelwright Sloth Rhinoceros
Kangaroo Dahlia Ezra Broker Orchid Electrician Heliotrope
Contractor Ichabod Opossum Isaiah Armadillo Nasturtium
Iguana Jonquil Ulysses Stenographer Stevedore

V

Do what it says to do

1. Write the letter *a*.
2. If two and two are five, write the letter *b*. But if two and two are four, write the letter *c*.
3. If two and two are more than two and four, write the letter *d*, but if they are less than two and four, write the letter *e*.
4. If the word that you see here after *cat* is *dog*, cross it out. *cat dog.*
5. Cross out all words on the next line which have both *e* and *t* in them.
   meat dress tack Peter guess tree.
6. If any word on the two short lines below has an *a* and also a *b* in it, do not cross it out. If it has an *a* in it and not any *b* in it, cross it out.
   bull tremble breakfast ask
   beat tear board animal
7. Look at these words. *idle tribe inch it ice ivy tide true tip top tit tat toe.*
   Cross out every one of them that has an *i* and has not any *t* (T) in it.
8. If the first word that you saw in this line had *a* in it, cross out every *a* in that line.
9. Look at these words. *Light white bright spite piteous city cited.* Whenever in those words you see the letter *t* with an *i* on one side of it and an *e* on the other, draw a line under all three.

10. Look at the two short lines below. Unless you see a word which has the letters *t*, *h* and *e* all in it, do not do anything. But draw a line under any such word and draw a line over the word that comes next after it.
when then up down these and those
if but were not never there yet

VI

Do what it says to do

1. Write the letter *n* three times.
2. Draw a line under the word that begins with *w*.
big dog sick well had
3. Make the shorter line longer. —— ————
4. How many are two and one?
5. How many ears has a cat?
6. Put a dot over the *i* in pig. Pig.
7. Put two dots in the square. □
8. Put one dot in the middle circle. O O O
9. Draw a line below the square. □ O
10. Draw a line around the circle. □ O
11. Write your name.
12. Copy the second of these words. *big bag beg.*
13. Copy each of these words. *rose nose goes.*
14. Cross out the smallest dot. ● · ●
15. Cross out the largest d. d d d d
16. Cross out each *a* in these words. *Advantage derivation.*
17. Which is the coldest—spring, summer, autumn or winter?
18. Which is the longest—an inch, a mile, a foot, or a yard?
19. When is it warmest—in spring, summer, autumn or winter?
20. Which moves most rapidly—a snail, an automobile, a horse, or a chicken?

VII

Do what it says to do

21. Show by a cross which costs most: an orange
a suit of clothes
a pair of skates
a pound of sugar

22. Show by a cross which tastes best:
dirty paper
coal dust
roast beef
sour milk

23. How many legs has a horse? Write the answer.

24. How many more legs has a horse than a boy? Write the answer.

25. Show by a cross which you would like best to own:
a toy boat
a gold ring
a thousand dollars
a sharp knife

26. Show by a cross which you would enjoy most:
being hit with a club
having your shoulder pinched
receiving a gift of money
losing many toys

27. Show by a cross the word that means pleasant:
entrance
entreat
entangle
enjoyable

28. Show by a cross the words that tell something a boy ought to do:
perform miracles
overeat habitually
study his lessons
strain his eyes

29. Show by a cross which is hardest to do:
To run a mile in a second
To stay awake all night
To pay attention in school
To play outdoors

30. Show by a cross the least dangerous thing:
To sit in front of a trolley car
To sit in the snow all night
To play with a loaded gun
To sit still in front of a mirror

31. Show by a cross each word that means unhappy:
grotesque
wretched
sincere
miserable
sad
notable
sane
joyless
grateful
uncomfortable

32. Show by a cross each word that means '*to make clear*' or something like '*to make clear*':

    execrate
    elevate
    elucidate
    traduce
    explain
    clarify
    satisfy
    expound
    extort
    antipathy

[Other tests given out by Professor Thorndike, and used in the round tables and lectures, follow:]

I

Write words in the empty spaces to make the whole sentence sound sensible and right

1. See .... man and the little boy.
2. We like good boys .... girls.
3. She .... if she will.
4. Here is a man who .... do it.
5. The bird .... a song every morning.
6. The stars and the .... will shine tonight.
7. Good boys .... kind to .... their sisters.
8. The wind .... the dust into our eyes.
9. The best .... to sleep is at night.
10. It is good to hear .... voice .... friend.
11. During the .... weather the boys play in the shade.
12. The kind lady .... the poor man a dollar.
13. The little .... and his dog .... running a race.
14. The girl fell and .... her head.
15. The baby's toes are very ....
16. The rude child does not .... many friends.
17. The boy will .... his hand if .... plays with fire.
18. Boys must .... be rude to .... mothers.
19. The stars .... brightly at ....
20. The child .... the river .... was drowned.
21. Boys who play .... mud get their hands ....
22. The poor baby .... as if it were .... sick.
23. When the .... grows older he .... be a man.
24. The .... plays .... her dolls all day.

25. The sun .... in .... the morning and sets at night.

26. The boy who .... hard .... do well.

27. The poor little .... has .... nothing to ....; he is hungry.

II

Write words in the empty spaces to make the whole sentence sound sensible and right

28. .... weather usually .... a good effect .... one's spirits.

29. To .... friends is always .... the .... it takes.

30. .... are times in the .... of almost .... of us when we .... for a long life.

31. Men .... usually more .... to do heavy work .... women.

32. It is very .... to become .... acquainted .... persons who .... timid.

33. A shelter .... the weather is .... appreciated on a .... day.

34. The best advice .... usually .... obtained .... one's parents.

35. A home is .... merely a place .... one .... live comfortably.

36. It is a .... task to be kind to every beggar ...... for money.

37. One's real .... usually appears .... often in his .... than in his speech.

38. .... things are .... satisfying to an ordinary .... than congenial friends.

39. The sun is so .... that one can not .... directly .... causing great discomfort to the eyes.

40. Brothers and sisters .... always .... to help .... other and should .... quarrel.

41. Sometimes .... friends would really .... us more by doing .... than by .... to assist us.

42. One can .... much better .... when he is .... worried .... other matters.

43. Many persons .... before they think, and .... do not .... at all; they only talk.

44. When two persons .... about .... which neither understands, they .... almost .... to disagree.

[Following is the Hillegas composition scale:]

This scale for the measurement of quality in English composition by young people has been derived by methods that are described in the September, 1912, *Teachers' College Record*. (Reprint of pages 5 to 8.)

Sample 580. Value 0. Artificial sample.

LETTER

Dear Sir: I write to say that it aint a square deal Schools is I say they is I went to a school. red and gree green and brown aint it hito bit I say he don't know his business not today nor yeaterday and you know it and I want Jennie to get me out.

Sample 595. Value 183. Artificial sample.

MY FAVORITE BOOK

the book I refer to read is Ichabod Crane. it is an grate book and I like to rede it. Ichabod Crame was a man and a man wrote a book and it is called Ichabod Crane i like it because the man called ichabod crane when I read it for it is such a great book.

Sample 618. Value 260. Artificial sample.

THE ADVANTAGE OF TYRANNY

Advantage evils are things of tyranny and there are many advantage evils. One thing is that when they opress the people they suffer awful I think it is a terrible thing when they say that you can be hanged down or trodden down without mercy and the tyranny does what they want there was tyrans in the revolutionary war and so they throwed off the yok.

Sample 94. Value 369. Written by a boy in the second year of the high school, aged 14 years.

SULLA AS A TYRANT

When Sulla came back from his conquest Marius had put himself consul so sulla with the army he had with him in his conquest seized the government from Marius and put himself in consul and had a list of his enemys printy and the men whoes names were on this list we beheaded.

Sample 519. Value 474. Written by a girl in the third year of the high school, aged 17 years.

DE QUINCY

First: De Quincys mother was a beautiful women and through her De Quincy inhereted much of his genius.

His running away from school enfluenced him much as he roamed through the woods, valleys and his mind became very meditative.

The greatest enfluence of De Quincy's life was the opium habit. If it was not for this habit it is doubtful whether we would now be reading his writings.

His companions during his college course and even before that time were great enfluences. The surroundings of De Quincy were enfluences. Not only De Quincy's habit of opium but other habits which were peculiar to his life.

His marriage to the woman which he did not especially care for.

The many well educated and noteworthy friends of De Quincy.

Sample 534. Value 585. Written by a boy in the fourth year of the high school, aged 16 years.

FLUELLEN

The passages given show the following characteristics of Fluellen: his inclination to brag, his professed knowledge of History, his complaining character, his great patriotism, pride of his leader, admired, honesty, revengeful, love of fun and punishment of those who deserve it.

Sample 196. Value 675. Written by a girl in the first year of the high school, aged 18 years.

ICHABOD CRANE

Ichabod Crane was a schoolmaster in a place called Sleepy Hollow. He was tall and slim with broad shoulders, long arms that dangled far below his coat sleeves. His feet looked as if they might easily have been used for shovels. His nose was long and his entire frame was most loosely hung to-gether.

Sample 221. Value 772. Written by a boy in the third year of the high school, aged 16 years.

GOING DOWN WITH VICTORY

As we road down Lombard Street, we saw flags waving from nearly every window. I surely felt proud that day to be the driver of the gaily decorated coach. Again and again we were cheered as we drove slowly to the postmasters, to await the coming of his majestie's mail. There wasn't one of the gaily bedecked coaches that could have compared with ours, in my estimation. So with waving flags and fluttering hearts we waited for the coming of the mail and the expected tidings of victory.

When at last it did arrive the postmaster began to quickly sort the bundles, we waited anxiously. Immediately upon receiving our bundles, I lashed the horses and they responded with a jump. Out into the country we drove at reckless speed—everywhere spreading like wildfire the news, "Victory!" The exileration that we all felt was shared with the horses. Up and down grade and over bridges, we drove at breakneck speed and spreading the news at every hamlet with that one cry "Victory!" When at last we were back home again, it was with the hope that we should have another ride some day with "Victory."

Sample 571. Value 838. Written by a boy in the Freshman class in college.

VENUS OF MELOS

In looking at this statue we think, not of wisdom, or power, or force, but just of beauty. She stands resting the weight of her body on one foot, and advancing the other (left) with knee bent. The posture causes the figure to sway slightly to one side, describing a fine curved line. The lower limbs are draped but the upper part of the body is uncovered (The unfortunate loss of the statue's arms prevents positive knowledge of its original attitude.) The eyes are partly closed, having something of a dreamy langour. The nose is perfectly cut. the mouth and chin are molded in adorable curves. Yet to say that every feature is of faultless perfection is but cold praise. No analysis can convey the sense of her peerless beauty.

Sample 177. Value 937. Written by a boy in the Freshman class in college.

A FOREIGNER'S TRIBUTE TO JOAN OF ARC

Joan of Arc. worn out by the suffering that was thrust upon her, nevertheless appeared with a brave mien before the Bishop of Beauvais. She knew, had always known that she must die when her mission was fulfilled and death held no terrors for her. To all the bishop's questions she answered firmly and without hesitation. The bishop failed to confuse her and at last condemned her to death for heresy, bidding her recant if she would live. She refused and was lead to prison, from there to death.

While the flames were writhing around her she bade the old bishop who stood by her to move away or he would be injured. Her last thought was of others and DeQuincey says, that recant was no more in her mind than on her lips. She died as she lived, with a prayer on her lips and listening to the voices that had whispered to her so often.

The heroism of Joan of Arc was wonderful. We do not know what form her great patriotism took or how far it really led her. She spoke of hearing voices and of seeing visions. We only know that she resolved to save her country, knowing though she did so, it would cost her her life. Yet she never hesitated. She was uneducated save for the lessons taught her by nature. Yet she led armies and crowned the dauphin, king of France. She was only a girl, yet she could silence a great bishop by words that came from her heart and from her faith. She was only a woman, yet she could die as bravely as any martyr who had gone before.

[Following is the History test:]

TO BE FILLED OUT BY PUPIL

Name.. Date....................................

School.. Class..

HISTORY YOU HAVE HAD

(Use √ mark.)

CLASS.	ANC.	MED.	ENG.	U S.
5th Grade.........	......	......	......	......
6th Grade.........	......	......	......	......
7th Grade.........	......	......	......	......
8th Grade.........	......	......	......	......
1 H. S............	......	......	......	......
2 H. S............	......	......	......	......
3 H. S............	......	......	......	......
4 H. S............	......	......	......	......

DIRECTIONS: Spend not more than SIX minutes on this page. Stop when signal is given. Answer each question in one or two words.

(1a) Give the name of the commanding general of the American army at the Surrender at Yorktown.

General ....

(2a) Who invented the cotton gin?

....

(3a) State three compromises made in the formation of our Constitution.

Compromise about..

Compromise about..

Compromise about..

(4a) What was the most important crop in Virginia in 1790?

....

(5a) Give the name of the commanding general of the American army at the Battle of New Orleans.

General ....

Directions: Spend not more than EIGHT minutes on this page. FOUR on each question. Stop when signal is given and go on to the next question.

(1b) Suppose that you know these facts:

(a) That in 1795 John Jay resigned as Chief Justice of the Supreme Court of the United States to become Governor of New York State.

(b) That in 1910 Charles E. Hughes resigned as Governor of New York State to become an Associate Justice of the Supreme Court.

What does this tell you? ....

(2b) Suppose that you know these facts:

(a) That since the time of Andrew Jackson the people of the United States have nicknamed their presidents, for example. 'Andy' Jackson, 'Abe' Lincoln, 'Teddy' Roosevelt, 'Bill' Taft and 'Woody' Wilson.

(b) That before the time of Jackson, such a thing was not usual, for instance, we *never* hear of 'Georgie' Washington, 'Jack' Adams, 'Tom' Jefferson, 'Jim' Madison, or 'Jim' Monroe.

What does this tell you? ....

Directions: Spend not more than FIVE minutes on this page. Read the question over *carefully*.

(1c) Do you know the story of the rescue of John Smith by Pocahontas?

Answer YES...................... or NO......................

(2c) Suppose that you know these facts:

(a) In 1608 in a pamphlet called 'A True Relation,' John Smith tells of being captured by the Indians, and *makes no mention of Pocahontas at all*, simply saying that Powhatan treated him very courteously and sent him back to Jamestown.

(b) In 1624, in his 'General History of Virginia,' John Smith tells the story of the *same capture* by the Indians. He says that the Indians were about to dash his brains out against a rock, when Pocahontas risked her life and saved him.

(c) In 1616, Pocahontas went to London as the wife of John Rolfe. There she was treated as a princess, and was lionized by all the court. She died in 1617.

Knowing these facts, in your opinion did Pocahontas really save the life of John Smith?

Answer SHE DID.................................. or SHE DID NOT..........................

(3c) Give your reasons for this answer. ....

The Conference convened at 2:30 p.m., pursuant to adjournment, in the Auditorium of the Student Building, and was called to order by Mr. B. F. Moore, Superintendent of the Muncie Public Schools, presiding officer for the afternoon session.

THE PRESIDING OFFICER: This is not to be an afternoon of speaking. It is to be an afternoon of conference. The conditions under which the program for this afternoon was formed differ somewhat from those which controled the making up of the program for this morning. In forming the morning program the committee did not know whether Dr. Thorndike would be here on time or not, and it was necessary to have someone to introduce the work who could make a speech. They therefore put on Superintendent Greathouse and Dr. Bryan. This afternoon it is positively certain that Dr. Thorndike will be here, and among the qualifications required in the Chairman for this afternoon is that he be a person who cannot make a speech, and who therefore will waste no time attempting to do so; so that we may begin our work at once on the program for the afternoon.

Dr. Thorndike will make a few preliminary remarks, and then the meeting will be open; and those who desire to ask Dr. Thorndike questions will have opportunity to do so.

TESTS OF ORAL AND SILENT READING

DR. THORNDIKE: Mr. Chairman, ladies and gentlemen—To refute once for all these slanders that have been indulged in by various speakers here today in regard to the uncertainty as to whether I would be here for the morning session or not, I want to say that I never was late in my life, and that there wasn't any doubt about my being here, and that these speakers were slated for these speeches this morning before I was thought of!

I have here samples of some of the tests we have been giving in the classrooms. I intended to give you the papers as they were filled out by the children, but it was thought that they should go back to the school.

I will speak for a few moments about ideal educational tests in reading; first, of tests for silent reading, and then for oral reading.

These tests which you have are not ideal. An ideal test is one that measures perfectly the fact we want to measure. Suppose the fact is the range of vocabulary, the knowledge of English words. An ideal test would be four, six, eight, or ten tests, such that the score which the teacher got in those tests would tally exactly with the score he would get if he tested with every word in the whole language. The second desideratum is that little time should be required to give the test; and these tests which you have fairly well fulfilled that, in spite of the agitation caused by so many visitors, the new place, and the like. It took about two and a half minutes of my time in each room to test about twenty-five to forty children, and more could have been tested just as well. All that was required was for the teacher to take the blanks and give them out, and, as they were handed in, to put down the time at which they were handed in.

The third desideratum is that the time required to score the tests should be short. Obviously, test in the form of cancellation, where you simply check a certain thing, can be scored very quickly. Even children who could not themselves do the test could be taught to score it correctly. The tests are in the right line, in so far as ease in giving them and scoring them is concerned.

The fourth desideratum is that the test be one that can easily be given by the ordinary teacher. If we must have scientific workers to go about making measurements of school progress and school achievement, obviously we cannot get many such made. But there is not a person in this room who would not be able to test three classes of children with these tests in a short time.

The intention has been foremost, in fact, in planning tests like this, to get an instrument of measurement which not only the ordinary teacher can give, but which is far easier to give than a plain ordinary examination, or an ordinary lesson in school. You have simply to write a few directions on the blackboard and give these blanks out. Make the papers up in sets. Distribute them bottom side up, not letting the children touch them with their pencils until you tell them to. Say, 'Read what it says on each page and do what it says to do.' Put that on the blackboard for them to read. Give the signal to go, and have them turn the papers over and all begin at the same second. Take the time when each child turns in the completed papers. Any person who can read the alphabet can score these tests. The scoring is automatic, and requires no mental energy or insight.

These blanks that you have are only a few samples. I think you will be interested if I read you some of the other tests for silent reading. I will read you a few samples of tests of what we may call the constructional side of reading.

These are graded tests beginning with the easier and stepping up to the harder and harder. This is test No. 1149. 'Read this and then write the answers to questions one, two, three, four, five, six, seven and eight. Read this again as often as you need to.' And this is what is to be read:

'Tom gave a gray cat to Mary. She gave him a black dog.'

The first question is, 'What did Tom give the girl?' The child writes in the answer, 'A cat.' 'What did the girl give Tom?' The child writes 'A dog.' 'What was the girl's name?' If the child can read that, he writes, 'Mary.' 'What color was the dog?' The child writes, 'Black.' 'What color was the cat?' 'Was the dog the same color as the cat?' 'Did Mary give Tom anything?' 'Who gave the cat to Mary?'

Now we jump to a very much harder one. This is almost at the other extreme. 'Read this and then write the answer to questions one, two, three, four, five, six, seven, eight, nine and ten. Read it again as often as you need to.' This is what is to be read:

'It may seem at first thought that every boy and girl who goes to school ought to do all the work that the teacher wishes done. But sometimes other duties prevent even the best boy or girl from doing so. If a boy's or girl's father died and he had to work afternoons and evenings to earn money to help his mother, such might be the case. A good girl might let her lessons go undone in order to help her mother by taking care of the baby.' That is what is to be read. The questions are:

'First. Must a good boy always do all his school work?'

'Second. Will a good girl sometimes fail to get all her lessons?'

You see how much more difficult the construction is. The auxiliary verbs and the dependent clauses require a very good constructional sense.

'Third. What are some conditions that might make even the best boy leave school work unfinished?'

'Four. Answer the question just asked, supposing it to be a girl instead of a boy.'

'Five. What must the boy do in the evenings to help his family?'

'Six. How could a girl be of use to her mother?'

'Seven. What is it that might seem at first thought to be true, but really is false?'

That is a little bit like the old question, 'Who drove how many times around the walls of Jericho?' They would be very bad questions as means of instruction, but are very good to test a person's ability to read complex sentences.

'Eight. What sort of boys and girls does the paragraph tell about?'

'Nine. What might be the effect of his father's death upon the way a boy spent his time?'

'Ten. Who is mentioned in the paragraph as the person who desires to have all lessons completely done?'

We have to arrange the things to be read and the questions to be read and answered so that in every case there is no difficulty whatever in answering the question if the child can read it understandingly. The questions are simple, except in the difficulty of reading them.

I will also give you one further sample of the 'range of vocabulary' tests. This is rather a good one for a very difficult test. It is a case of 'Mark with "C" words about church and religion, with "W" words about war and fighting, with "B" words about business and money, with "R" words about relatives and the family':

Fight, brother, priest, pay, bottle, sister, buy, camp, flag, mother, money, defend, pray, sell, hymn, gun, father, captain, firm, owe, defeat, fort, aunt, merchant, cannon, conquer, tax, flank, psalm, finance, fortress, invest, bishop, monk, uncle, profit, creed, interest, guard, convent, nephew, freight, general, orphan, dagger, income, troops, marriage, worship, ownership, chaplain, nun, cousin, lease, colonel, abbot, niece, captive, altar, relative, military, insolvent, infantry, catholic, fortification, baptism, descedant, purchase, offspring, invader, indorse, commander, adoption, brigade, battery, curate, generation, cartridge, kinsfolk, blockade, cardinal, divorce, strategy, guarantee, garrison, rebate, buckle, catechism, installment, canonical, sentinel, forgery, citadel, patent, campaign, mortgage, cavalry, cloister, kinship, insurance, ordinance, episcopacy, genealogy, corporal, rampart, ecclesiastical, lieutenant, progenitor, friar, bulwark, indemnity, entrenchment, litigation, manœuver, recruit, penitential, lineal, halberd, pontifical, adjustment, protestantism, legatee, monasticism, ammunition, negotiable, belligerent, peculation, canteen, chancel, monachism.

Now, for oral reading, I will simply read one of the earlier and one of the later tests, of a set of twenty passages graded in difficulty from very easy to very hard. The series begins with No. 1:

'It was time for winter to come. The little birds had all gone far away. They were afraid of the cold. There was no green grass in the fields, and there were no pretty flowers in the gardens. Many of the trees had dropped all their leaves. Cold winter with its snow and ice was coming soon.'

And it ends with No. 20:

'Read the following sentences correctly: Sophistry is fallacious reasoning. They resuscitated him. Verbiage is wordiness. Equanimity is evenness of mind. He has a pertinacious, obstinate disposition. There was subtlety and poignancy in his remarks. A hypocritical or pharisaical nature is usually cynical.'

Those are the two limits in this series of passages. These are not yet fully worked out. Mr. Gray, formerly of the University of Chicago, with us at Teachers' College this year, has done a great deal of experimentation with this series, and he will improve it. Finally we shall have a standard series of sixteen passages, such that at any time you can define the pupil's ability in oral reading by how far up those he can read, say making less than seven mistakes, or taking some fixed number of mistakes as a convenient number. It is a systematization or organization of the kind of thing we all do. Instead of looking about for a reader on his desk to test a new pupil, the teacher would take the standard test-series. Later on, we shall make up ,a hundred tests, so that the children could not, by cramming up for some one test, get a better rating than they were entitled to.

There are many other things I might say which will probably be brought out in the course of the discussion. I should prefer to answer questions rather than to go on from my side. Let somebody begin, and I will do the best I can to answer your questions.

The following questions were put to Dr. Thorndike, which were answered as follows:

QUESTION: How are the words selected for these tests, Dr. Thorndike?

DR. THORNDIKE: For the range of vocabulary tests, (1 to 4), the words were selected by me in a very rough, preliminary way to get a starting point. We will eventually change those tests, picking out those words which give us the most information with the least expense of time. I have in all, something like nine hundred words arranged in tests of this sort; but the words of tests 1-4 were simply chosen by me so as to get a good wide range from easy to difficult.

One important thing in the tests is to include prepositions and conjunctions and relative pronouns and other relational words, and I have done that in some of the tests which I have not brought here at all. In these other tests, for example, one of the kinds of words to be marked is words that refer to direction, using such words as 'beyond,' 'behind,' 'in,' 'out,' 'up' and 'down.' Another is 'words that refer to distance.' In that way we can arrange to work in these very important relational words that are omitted in these samples that you have. The way to construct the tests is to take a dictionary and go through and find out words which give you good classifications with a wide range of difficulty. It is hard to do with prepositions, conjunctions, and pronouns, but it can be done.

QUESTION: How do you know whether the child understands what he is reading?

DR. THORNDIKE: I should have said that in the oral reading tests there is no question of interpretation. We don't know whether he understands it or not, save in so far as he reads it as if he knew what it meant. In the silent reading tests there are questions on the test, and then you can tell. For interpretation, you do need the 'continuous paragraph' tests.

When I said 'Tests of oral reading,' perhaps I should have said, 'Tests of ability to pronounce certain words correctly.' In my paragraphs for silent reading, I was careful to have connected thoughts. For example:

'It may seem at first thought that every boy and girl who goes to school ought to do all the work that the teacher wishes done. But sometimes other duties prevent even the best boy or girl from doing so. If a boy or girl's father died and he had to work afternoons and evenings to earn money to help his mother, such might be the case,' etc.

You will recall the questions that went with this. With the so-called series for oral reading, on the other hand, as a matter of fact you cannot tell how far the child understands. The child can pronounce the word just as an actor can speak a part, and you cannot distinguish with a mere oral test what he understands about it. The one thing you do in oral reading is, you test his ability to pronounce English words. You may or may not test more. But to test more, there is a far better way—that is by asking questions about it. That can be done much more economically in a written test than in an oral test. Other things being equal, it takes exactly fifty times as long to give an oral test as it does to give a written one. For you can give a written test to fifty as well as to one.

THE PRESIDING OFFICER (SUPT. MOORE): The Secretary requests that all persons who ask questions stand up and give their names. A complete record is being kept of our proceedings, so stand up and state your questions plainly and clearly, so that we can all hear; and give your name.

Dr. Thorndike: But if anybody wishes to ask a question who is too modest to stand up and announce his name he may give his question to some neighbor who has a 'bold front' and who will ask it. We want to get every question asked.

Question (Mr. Fagan): Dr. Thorndike, should not the oral reading also be a test of the understanding of the selection read?

Dr. Thorndike: I will have to give the same answer to that. All that a test in oral reading, for scientific purposes, is good for is to do something that you cannot do by a written test. A written test has a fifty to one advantage.

Question (Mr. Fagan): Why?

Dr. Thorndike: Because you can give it to fifty children at once. It only takes one-fiftieth as long.

Question: Why cannot you use passages from literature, while you are giving it?

Dr. Thorndike: You can, but it is difficult to secure it.

In order to make our discussion a little safer, let us drop the term, 'oral reading test,' which I think is unfortunate, and use the words, 'test of pronunciation of English words,' because everything except that, you can measure more efficiently by the written test.

The teacher in ordinary cases may not object to the extra work, and it may be more sociable to test one child at a time; but suppose I wished to test the reading ability of this group, what would be more idiotic than for me to do it one at a time. Obviously the reasonable way to do it would be to give you something to read and then give you some questions about it; and I could give you questions where the questions would be also a test of other things.

Let me tell you the experience of Mr. Gray, who began this work with a pronunciation test. He wants now to abandon oral tests. He does not want to bother with oral tests any more. He wants to use these written 'response' tests which we have been using. He does not think that the advantage to be gotten from pronunciation, from the pronunciation side, is enough to make the extra time well spent. That is the reason why he proposes to give it up. At the same time—for we do care about the person's ability to pronounce words, and there is a reason why we should care—if the child on seeing the word can pronounce it, and if on hearing a word he knows its meaning, then by seeing the word and pronouncing it, he can know its meaning. It is conceivable that in some ecclesiastical families the child will have heard some ecclesiastical word like 'monachism,' for instance, pronounced, and would know that word in that way. That, to my mind, is the value of the pronunciation test. But I do consider the silent reading tests are very much more important, and I do not exactly blame Mr. Gray if, in a way, he wishes to give up the others.

QUESTION (MR. NEET): Dr. Thorndike, it looks to me as if in those written tests the child had a chance to stop and deliberate, and so could interpret, if you give him time. Now, in the oral reading, that is not the case. He reads and must get the thought right off, if he reads to any purpose.

DR. THORNDIKE: That is correct. However, we are not testing interpretation in the oral test. This is not a test of expression, or of elocution.

QUESTION: Is this a fair measurement, a fair test of his ability, to get the thought from the selection, if you give him as much time as he wants?

DR. THORNDIKE: But you take a measure of the time he takes, or you can crowd him, if you wish to. You can have him do it just as fast as he can, and, if he doesn't get it in one second, go on to the next. You can mark his time as you mark the words. I should, however, ordinarily give them the time that seems to be necessary, and record the time.

QUESTION: It is not a test at all of his ability to express thought?

DR. THORNDIKE: Not at all. As a matter of fact, the passages for pronunciation make no effort to even have a secondary use for expression. The question about passages from literature would be specially appropriate otherwise. As to an expressional test, you want to get something with some 'go' to it, and no attempt is made to get that. That should be got by a separate series of tests. We do not try to kill too many birds with one stone in the measurements. It is much better to do one thing at a time, and know what we are doing. We do not want to give an expressional test, until we are sure that the child is grounded in the meaning of the passage in question. Teach him what it means and then test his power to express afterwards. Don't confuse ability to read and understand with ability to express. Also, do not confuse ability to pronounce with ability to understand. They are different things. Take one at a time.

QUESTION (MISS JOSEPHINE BAUER): How would you measure the ability or power of those whose power or ability to read is far beyond their power to express themselves?

DR. THORNDIKE: I think in a way I have already answered that by one of these tests. Suppose a child is able to read a question like this—'What is it that might seem at first thought to be true, but really is false?' That is about as hard a sentence by way of construction as you will find in reading; that is, for any elementary school. Suppose the child can designate correctly such words as 'legatee,' 'monastary,' 'chancellor,' 'monachism,' 'peritoneum,' 'habitual,' 'ligament,' 'starboard,' etc.—those are just about as hard words as he gets. On the one hand, we have got his ability to read the hardest kind of constructions and words. On the expressional side, the requirement is that he should write the words, 'That the boy or girl should always do all his work,' etc. That is not a very hard task of expression. There might be one child in ten thousand who could read this paragraph and these questions about it and not be able to write out or think out and write out 'Doing all his work always,' but there certainly would not be more than one child in several thousand that would be in that position.

QUESTION: Is it not a fact that some of these questions they could read, but could not answer?

DR. THORNDIKE: I agree with you that many, many questions a child could read that he could not answer. But commonly the answer that is required in these tests is a word like 'yes,' 'no,' 'black,' 'white,' 'it is,' 'it is not,' 'yesterday' or 'tomorrow.' They are simple words—simple declarative sentences in a word or two. The general point is that you want hard reading with easy answers, in a written test.

QUESTION: And you have that?

DR. THORNDIKE: We try to get it in the vocabulary and 'response' tests.

QUESTION: Could not the child give a better oral answer than written answer?

DR. THORNDIKE: All he has to do is to write 'C,' or 'W,' or 'B,' etc.,—'C' for words about church and religion, 'W' for words about war and fighting, and 'B' for words about business and money. He can write that just as well as he can say it. All these 'range of vocabulary' tests use the principle of cancellation. All he does is to write one of four letters. Also, you do not demand any quality in his answers to the paragraph tests. In other questions, the quality of his answer is a factor, but no rhetoric is required here, nothing flowery or charming. It is perfectly matter-of-fact. His responses are of the simplest sort; so that in looking over the papers of some three thousand children there has never been any case of any difficulty. Where you examine the child and find that he cannot do it in writing, he usually cannot do it orally, or in any way. This is a very important point. In ordinary class-room procedure, or in an oral test, we can give vague and loose questions; but in a written test we must give a question such that, if the person is to be defined as having done the thing, we must not require any more of him than doing the thing. The thing being reading, we must make the expressional test so perfectly easy that anybody who can do the reading can do that.

QUESTION (MRS. BELL): Would not the result be very different in a vocabulary test if the words were given in sentences instead of in isolation?

DR. THORNDIKE: Oh, yes. I will take a minute for that. Suppose a child is defined as having not read such words as in our test here, 'electrician,' 'heliotrope,' 'contractor,' 'Ichabod' and 'apostle.' He is marked as having failed on those. Does that mean that he can never read those words under any circumstances? Certainly not. It means that he does not mark those correctly *in this test*. If the child had the sentence: 'An electrician is a person who works with wires and electric current,' he might very well read it understandingly. If he had the sentence: 'Amongst the beautiful flowers in my garden is a pink heliotrope,' he might read it. No doubt he would read it. If he had the sentence, 'My brother's name is Ichabod,' he might perfectly well read it. The measurement of his ability to read is *for this particular blank, with this particular type, with the words in this particular order;* and what we infer from that with respect to other things, is a matter to be discovered later.

That is in connection with my first point, that the ideal test would be one where, just as soon as you got the record, you knew about the person's entire reading ability. Of course nobody has got any such test as that.

QUESTION: Has anyone else made a test on oral reading to bring out the thought, expression, and all that? That ought not to be very much more difficult than the tests that you are giving us this afternoon.

DR. THORNDIKE: The question concerns a test for the expressional side of oral reading. Oral reading has a double meaning. Its first meaning is:—'From visible symbols producing the correct sounds.' Its second meaning is that sort of reading in which, let us say, Henry Irving would be better at reading than anyone else in this room, and takes into consideration all of the elocutionary effects, voice effects, and so on. Until we get a phonographic instrument that will enable us to make a perfect voice-record, a test of that second sort is probably impossible. The way the test will come will be that people will do the reading into a phonographic instrument, making a perfect record, and the record will be kept and scored by people who are qualified to do it. At the present time, the phonograph is so metallic and imperfect that it is impossible to get a perfect voice-record, and we have to depend on personal opinions, and such measurements are subject to the difficulties and defects that we are trying to avoid.

QUESTION (MISS ALEXANDER): Don't you think it is impossible to measure the emotion of the reader, or weigh the effect that a piece of literature has had upon him by the voice and expression that he gives it?

DR. THORNDIKE: The question I suppose is whether it is possible to tell, not only about his elocution, but also about his inner feeling and appreciation. It is not possible for me. It is possible for many gifted people, but I have the feeling about these gifted people who can do it that they are a little bit like our friends who often say that they can always tell an honest man when they see him, but who are constantly getting cheated and losing their money! We have all at times the feeling that we can tell, yet we find the parents and teacher taking opposite views in the matter, and they cannot both be right. The boy may be cheating them both, as a matter of fact. It can be done, but it is nothing that you can do with paper or phonographs; nothing that you can do with uniformity. It becomes a subjective matter of the opinion of people who by insight detect the emotional attitude of a pupil.

QUESTION: Professor Corson in his 'Spiritual Void' says that the way he tests students for literature when they come to Cornell is to ask them to read aloud a piece of literature; and I have heard this said, that the voice can be trusted, but not the eye. If you wish to test anybody, look away and listen to the voice. I think the highest test in reading is the emotional test. I think the child might stumble over the words if he gets the grand meaning, the emotional meaning, of the selection.

DR. THORNDIKE: That is another story. I am in entire accord with the speaker except in one or two little particulars. Mr. Corson picks students for English by the power of expression, and the impression he gets. He has had long experience, has done it year after year; but I would not trust myself to do it for a minute. I do regard the ability in a child to stand up, and in a clear, frank way show forth what he feels, as being a very valuable thing; and I think that, in so far as it can be tested it has to be tested, just as has been described, by the personal impression of somebody who is good at that sort of thing. It is a gift that cannot be passed around. Mr. Corson could do that, but he could not tell us all how to do it. Some people can detect sincerity and insincerity, but they cannot give us a basis to do it by. I want things that I can do with fifty pupils at once and with a little piece of paper. So I leave that other side of testing for people who have a special gift for it.

QUESTION (MR. BALL): If you want to make a test of the reading of the fourth grade what test would you give, what order?

DR. THORNDIKE: The question concerns an inventory or survey of the reading ability of a fourth-grade class. Of course none of these things are perfected, but I should first test the range of vocabulary for word knowledge after the same general plan as this that I used in this set of blanks, watching particularly for the conjunctions and prepositions. Then I would use a response test where the child would have to read something, and show that he had read it by doing something correctly, by answering questions, by marking with an 'A,' or by putting a cross on certain things, or by putting a nose on a face, or whatever it may be, which would show that he had read the thing and understood it. In all these cases I should record the time taken, but I should consider quality as far more important than time for my final estimate. I would then go on to a pronouncing test, following somewhat the same plan. In the fourth place, I would use a test of an informal sort—I should call it an 'omnibus test—where the child would read a short story, something say two pages long, and be given a chance to use all the help he could get, to use a dictionary or anything that would give him light. I should give a written test on that story, following the criterion I have suggested, that the answers must be something requiring very simple expression, so that the tongue-tied, halting child could write them. These questions shall test, not only the factual side of what was read in those two pages, but also the emotional and aesthetic and ethical values, and that is especially difficult to do. It is very hard to get questions which test aesthetic and ethical values with simple answers, because the words that are required in the answer tend to become too hard. You cannot simply say 'Like it' or 'Not like it.' You get too 'thin' a record, if you do. We must also include enough passages proper for fourth grade children—and you might have quite different questions for the boys and girls—to get the best results.

That does not mean that the inventory is entire. It is not entire. If you are a good judge of enunciation and elocution, I would have you rate those children also on a scale of one to ten for enunciation, for the precision with which they use English vowels and consonants; (and you really ought to have a man trained in phonetics for that, to do it properly). Then, there is the elocution. General power of reading, is not only to read in the abstract, but it is to stand up, to hold your shoulders back, and look people in the eye, and all that sort of thing. Each one of those things would have to be recorded and rated by themselves. One could consider that these latter were not an element in an ordinary reading test, but that they belonged in a general character test.

QUESTION (MR. BROWN): Dr. Thorndike, something has been said about the vocabulary tests. Are they not tests more on the home environment than upon the school work?

DR. THORNDIKE: That is a good question. The question is, are not these measures, in the long run, more tests of the child's opportunity than of the child's capacity. They are not a measure of the child at all. They are a measure of the reading product. If the child does it by a miracle, if he does it in his sleep, if the child gets another child to do it for him—none of those things are measured by the test. I hand you out as a record one of these blanks we get in Mr. Smith's school. The child has written on the blank. Whether the child did it by the aid of spirits, whether he did it by some sort of subterranean means or not, we do not inquire. That is not the question, the behavior of the child. The question is, what is the product? We have got that on his blanks. We can measure that product. To interpret that product in the terms of a child is a further task. For that further task we must know his behavior intimately. We have, for example, to watch against cheating. I did not do that today, but we can do it. We can guarantee that the child whose name is written on the paper is the child that produced that work. We can do that. We can go a little step farther and say this was done by the child whose name is on the paper in a natural way, by natural means, at that time and place. What does it signify? Thereafter you have to get into the child's history. It is not on the blank. That requires an examination of the circumstances. The same product written by a person who came from Germany three weeks ago and written by a person who had been born and bred here in Bloomington, has a different educational significance. The same product does not have the same significance except when it comes from the same person under the same circumstances. But that is another story and a very long story.

QUESTION (MR. GRUVER): When the children take these tests do they enter into the spirit of the thing, and do you get anything like uniformity in the emotional attitude, the absence of nervousness, zeal, and interest in the tests?

DR. THORNDIKE: Of course that is a question for demonstration. The point about this test is that it can be given by the regular teacher in the regular course of work. Given under those conditions, there need not be any strangers there, and the children do take an interest. That is the reason why the tests are made in this way. That is the reason why this 'checking' device is chosen, why this 'response' method is chosen; so that there need not be any strangers present. So done, as a regular procedure once a month, or as an interesting game brought in by the teacher, there has never been any nervousness to amount to anything on the part of any of the children. They like the tests, and they are a little puzzled and vexed when they come across a word that they cannot manage; but the thing is like any ordinary school test with them, or like a new school game that you bring in. Certainly, if you repeat the thing so that it becomes a routine matter, that presents another question, but that objection holds as logically against any form of achievement. Any achievement is the product of interest in the particular thing, as well as capacity for it. In any case, there must come into question interest, determination, nervousness, irritability, temporary sickness, and the like. But that lack of uniformity you cannot prevent by any means on earth. You can reduce it, as far as possible, by getting something that is interesting and attractive and at the same time something that is unlike the regular routine of the school work. That is one of the ideas I had in mind, in framing these tests; but I do not pretend that we cannot do a good deal better than has been done in that respect. I thank you. *(Applause.)*

THE PRESIDING OFFICER: One of our distinguished Indianans, addressing an audience in another state, said that all good men, I think he said all great men, come from Indiana, and the greater they are, the sooner they come. Now, our speaker this afternoon is a refutation of the statement that all great men leave Indiana. He is a Hoosier born, and has chosen to work out his life's work on his native heath. I am very glad indeed to introduce to you Professor Jones, who will give us an address on a little different phase of this matter of tests. Ladies and gentlemen, Dr. E. E. Jones, Professor of History and Philosophy of Education, Indiana University. *(Applause.)*

RESULTS OF BINET TESTS

PROFESSOR JONES: Mr. Chairman, ladies and gentlemen—I promise not to detain you very long. It is now almost four o'clock, and I feel certain that most of you would prefer to be out in this beautiful evening air to listening to me. I also feel just a little embarrassed in following my distinguished instructor in giving a very preliminary discussion upon the subject of the Binet scale of intelligence. The discussion that I shall give of this scale is a very preliminary one indeed. I shall try to state something of the history of this scale, what it has done, what it may be used for, and something of its limitations; and then I shall try to compare it with the scale that we have been trying to work out here, the scale of intelligence that has been worked out here in the laboratories of Indiana University during the past three years.

About ten years ago Professor Binet thought out the scheme of having a certain gradation of questions which might be put to children in order to determine their psychological age. Of course, it is equally important to determine the physical age of a child, but it is sometimes difficult to determine how old an individual is psychologically. Professor Binet was interested in determining the psychological age of children, and he realized the greatness of the problem at once, because it meant the selection of children of certain ages,—different groups of children, of different social conditions, of different intellectual conditions, of different conditions in the family, etc.; and he spent a great deal of time in formulating a series of questions which might be put to the child, which if answered, he could determine in that way the psychological age of the child.

For example, he started with the three-year-olds, and brought together a large number of them, those that had splendid hereditary lines, and those that had poor hereditary lines—all classes, as many as he could get together of three-year-olds, and, by asking simple questions, found the average intelligence of this group, eventually reaching a series of questions which if propounded to a three-year-old child, and the child could answer, Professor Binet claimed that the child's psychological age was three years. If he could go beyond that and answer more difficult questions, he might be three and a half years old, or four years old, psychologically; or, possibly, a child that was three years of age might be bright enough to answer questions which were ordinarily propounded to the four year old; but after a great deal of experimentation and a great deal of questioning of children, he reached a gradation beginning with the three-year-old and reaching clear up to adult life.

The three year old is asked to point to his nose, to his eyes, to his mouth. He must do all three of those things, in order to get the grade for a three year old.

He repeats these expressions: 'It rains.' 'I am a little hungry.' If the three year old is able to do that he is scored positive. He repeats two digits thus: 'seven,' 'two,' about one second apart. If he is able to do it he is scored positive.

And then Professor Binet prepared some pictures for use in testing children's intelligence. There were four of them originally, but later he used ten. They are shown to the child, and he is asked to state what he sees in the picture. The child enumerates—merely enumerates. If there are three or four he simply says, 'horse,' 'cow,' 'man,' 'dog,' or whatever he sees in the picture. That is considered a positive answer. Ten of these are presented to the child, one after another, and if he answers all these questions positively he is scored three years old, psychologically. Then if he answers all these questions very easily, he may possibly go on to the next year; and in the fourth year I will give you the questions, so that you may see how they are graded.

Professor Binet says that the child three years old should be able to tell his first name, but not necessarily his last name. Every child three years old should be able to give his first name.

In the fourth year he should answer the following questions: The child is asked whether it is a boy or a girl; the child is to recognize a key, and a knife, and a penny, and give the proper name; and for auditory memory the child is to repeat three digits, 'seven,' 'four,' 'eight,' given about a second apart; also, two lines are presented which are pretty close together in length, one just a little longer than the other, and the child is asked to state which is the longer of the two. Now, if the child is scored positive on all these, although he is only three years old biologically, he is really four years old, says Professor Binet, psychologically considered.

So he goes on with lists of questions similar to these. I think in no instance are there more than five questions for any one year, and from the score that the child makes upon these five questions his psychological age is scored.

There have been some objections—some criticisms to the Binet scale, and I will mention very briefly a few of them. In the first place, it is claimed, and I think very truly, that the questions are too meager, that it is impossible to determine the psychological age of a child by asking him four questions. It does not seem possible to do so. It is barely possible that a child might be three years of age and not be able to answer some of these questions. He might not have a good auditory memory, and he might not be able to repeat the two digits if they were repeated a second apart. He might not be able to name the pictures; he might not know some of the pictures. He might fail in one or two points in the third year, and then he would be scored below three years, if he fails in a single question. If he fails in any one of these tests he is to be scored in the year before, says Professor Binet.

So one objection to the scale is that it is too meager. We cannot find out enough about a child in asking four or five questions to determine his psychological age.

A second criticism is that it does not point out, (although we may take it for granted that it does tell the psychological age of the child) it does not tell either the strength or the weakness of the child. If the child had a serious defect, (say he only measures three years old when he is five years old biologically,) there is nothing in the scale to indicate what is the trouble, what biological or physical fact may enter into his judgment in the matter; so that there is not much accuracy in the scale, and it does not tell us much more than we already know.

And on the other hand, if a child is superior, if it is an accelerate, and if it is away ahead of its grade, more intelligent than the scale calls for, if it is seven years old and measures nine by the scale, there is no way of telling by the scale itself just what is the reason that this child measures nine years of age. It does not point out the thing that makes this child superior. This I think is a criticism that is almost universal.

Another criticism that has been made is that the scale is not adapted to American children. A great many of the questions that have been employed and used by Professor Binet seem to be rather applicable to French children, more applicable to French than American children; and therefore, there are certain difficulties that have come in that have made it necessary for the Binet scale to be revised, and there have been a number of revisions of the scale here in America to make it suit American children.

Of course, I think the scale has been very greatly improved by Professor Turman and others who are now using a modification of it; and it is undoubtedly very much better than it was when it was first presented by Professor Binet in 1908.

There is another objection to the scale that is sometimes made, namely, that the method of scoring is not very good. A child may answer four of the questions in a single year and fail upon one, and therefore he is given credit for a year back. He is not given credit for precisely what he does in the scale. It would seem that in developing a scale for intelligence we ought to give the child credit for everything he does; that he should be given credit for his answers, if they are positive.

Three years ago we became very much interested in the Binet scale—very much interested in making some tests, especially upon deficient children. We had no instructions at that time, but we soon became convinced that there were serious defects in this scale

—that we could not apply it very well in all cases; and it always meant, if we found anything wrong with the child, that supplementary study must be made before we could tell how to treat the child, and of course that is important in diagnosis.

So we began the question of enlarging the scale, developing a series of questions upon different psychological traits which would in a measure enable us to classify the deficiencies or the excellencies of the child, and throw more light upon his psychological or physical condition. We worked upon it for a whole year without very much success, trying it out upon our deficient children and some others, as we found access to them; and the next year we attacked the problem more strongly by using a larger number of children, and this past year we have been working at it more diligently still, using larger numbers of children.

At the present time we have an investigation under way in the Bloomington schools in which we are giving the Binet scale, to every child in the public schools. In addition to this, we are giving this scale that we have worked out in the laboratory here to all children in the Bloomington schools, and we wish to see how it correlates with the Binet scale, and also with the grades as given in the public schools.

These are things that we thought well to undertake to find out about the child in order to test its real psychological age. First of all, we wanted to find out about its general intelligence; and second, we tested its visual memory; third, its auditory memory; and fourth, its reasoning; the question of imitation was another problem that we undertook to solve. The problem also of constructiveness, undoubtedly, one of the most important of all the tools in educational procedure; and then we had the question of motor ability, motor adaptation and precision in movement, etc.; also the question of touch. It was my observation in the clinic in the Indiana Girls' School, that large numbers of these girls who are mentally deficient were very markedly deficient in the sense of touch, and in the muscular sense; and this led us to an investigation of the sense of touch in relation to general intelligence. But the vocabulary test was used, and also what we have chosen to call here the rapid reading test, which is a mere rapid pronunciation of words that are familiar to the children in the first grade, simple little words, all words of three letters. We wanted this test to be applicable of course to all the children in all of the grades—the eighth grade can read such words just as well as the first grade.

Now, I have a few graphs here to show you, but I am afraid they are not large enough so that you can all see them. I have drawn these to show two things: To show how the scale works, that is, the new scale that we have worked out here, in comparison with the Binet scale; and also to show the very marked individual differences which come out.

Now, of course, we used the same method of determining what questions to propound in each year that Professor Binet used; viz., getting as large a number of children of the biological age as we could, and asking questions, and sifting those questions, eliminating those that were too hard and keeping those that were just about right for children of a certain age—that would be too hard for the year below, but would be about right for that age. That was the method that was employed by Professor Binet; and after a long time we selected questions that seemed to be appropriate for that age.

We used precisely the same method in developing the scales for the different psychological traits that we are testing or measuring that Professor Binet used; and by these means we developed a sort of median, a median which would represent the average difficulty, or median difficulty of questions for a certain age.

The red line here indicates that median, and the black blocks on either side of the red line indicate the variation from the median in the different mental traits which we were investigating.

Now, the first is general intelligence, and I have here represented a general intelligence test for the sixth year, keeping in mind that the red line is the median for the questions on general intelligence, which we developed by the same method that Professor Binet used. We have here a child, a boy of six years of age, who in general intelligence measures two years above the median which we found; and in visual memory he measures half a year below the median; in auditory memory he measures a year and a half above the median; and in rapid reading, or in reasoning, he measures two and a half years above the median. This median line corresponds very well to the Binet scale.

We tried to grade the questions which we asked as to difficulty, so as to be about of the same difficulty as the Binet scale, so that we could have them comparable. Of course I realized that that was a very difficult thing to do. The individual attitude, etc., comes in to make such a scale difficult, but we did it as best we could. I do not pretend to say that this median is just in the right place. As I stated in the beginning, I am giving you a merely provisional statement of the work we are undertaking to do, and it is barely possible that after we have tested a larger number of children we will make the questions a little more difficult, or eliminate certain ones and use others; but here is the present state of affairs.

Here is a child that is two and a half above in reasoning, and here is a child that is one-half a year below in rapid reading. Here is the eighth year, a girl that in general intelligence measures four-tenths of a year below.

I want to say that we give a child, in our scale, credit for everything that it does. Therefore, it brings in fractions of the year. Instead of eliminating the child completely because he does not answer one question, and say he must go to the year below, we give him credit for the other questions, and try to count up his psychological age in years.

Here is a girl eight years old that measures four-tenths of a year below in the grade for general intelligence; in auditory memory, six-fifths of a year above; in reasoning, a half a year below; and in rapid reading, one year above.

Now, I will call your attention to one case more. Here is a boy that is nine years of age, and you can readily see by glancing at his record here that he is an accelerate. He is considerably above that year, and would average probably a year or a year and a half above his biological age. He is nine years of age biologically, but he is easily ten or probably eleven years of age psychologically, according to this scale.

Now, the important thing that we want to emphasize, and the thing we are trying to work out is the individual differences in children, and what causes the individual differences. The important thing we are trying to do here is not so much to determine the psychological age. We don't care for that so much. That is not such a tremendously important thing to know. You already know that. For there is a very close correlation between the Binet scale itself and the grades in the public school, and so if you find that a child is retarded two or three years in the public schools, in a general way you can tell about how old he is psychologically, because there is such close correlation; but what we do want to know is, where the child excels, what psychological trait causes it to excel; what psychological trait particularly causes this child to do better in arithmetic, for instance. In giving the Courtis test why is it that one child scores twenty problems and another child only three? The Courtis test continually shows such great individual differences. All the tests we have made show such individual differences.

Now, that is a very important thing to know, but it is even more important to know the reason why. What is the special mental trait that produces such individual differences, these great individual differences that we find? That is the thing we are trying to find out here; and it seems to me we are doing it, in a way.

Here is a child, a girl seven years of age, that is a quarter of a year below the median in general intelligence; one year above in visual memory; one-half a year below in auditory memory; one year below in reasoning; and in rapid reading, she is above. In nearly all of these tests you will notice there is quite a degree of correlation between visual memory and the rapid reading test. I haven't time to stop and describe these different tests as I would like to, but there is quite a correlation between the visual memory and rapid reading tests which we have used. This indicates, very probably, I think, not only that there are individual differences, but we are able to put our finger exactly upon the thing that produces these individual differences. That is tremendously important. That is the all important thing for us to know in education, it seems to me.

Now there are some other problems that we expect to attack, some other psychological traits that we expect to attack, that I am not sure whether we will get results from or not. There is the problem of imitation, and of motor adjustability. It is difficult to standardize. It is difficult to get a standard of motorability or adjustability. How are you going to do it? It seems the physicians ought to do it. Physiologists ought to do it. Somebody of that sort ought to go at that problem.' Take the whole problem of constructiveness, the constructive instinct, the constructive ability of children. There is no standard by which we can say such a person should be graded a certain amount for constructiveness, and another person a year above that amount. To me that is a tremendously important thing in education. That is why we are troubling our brain with these fundamental things, trying to arrange them in some sort of a scale, so that we can apply this scale to individuals, and measure their ability in the various directions and then to adjust our educational procedure in accordance with them. It seems to me this whole thing is in line with modern thought and investigation on the subject of education.

I feel that this will help us in the solution of a great many of our problems. We are very much concerned in our vocational work, industrial education, in the vexed question of developing efficiency. What does that all mean? And why are we not getting anywhere? And why is it so difficult to get anywhere? Simply because we don't understand human nature. Because we are not able to take the individual child and find out these mental traits that he possesses. That is the all important thing for us to know in order to work out the industrial education problem. Here in Indiana we ought to have about a hundred educational psychologists to work on problems, experimenting and finding out standards by which we can measure children; and after a while we will get to such a point that the children themselves will want to know their records; that high school boys themselves will come to the records and ask to know what their records are, in order that they may determine wherein they are most efficient. Why cannot we reach such a point as that? Why cannot we have such standards that the boys and girls themselves will go to them and try to find out, try to discover how they may in their school work best adapt themselves to succeed in the life work that is before them. I feel, my friends, that this is the most important question in all education at the present time. I feel that we are beating the air until we do that thing. I feel that we do not understand where we are going. We are just forming a course of study and proceeding to cause children to absorb this thing that is dealt out to them, without any psychological basis, without any educational basis, without any physical or anthropological basis at all. I think that is the important thing for us in education at the present time. *(Applause.)*

FRIDAY, APRIL 17—EVENING SESSION

The Presiding Officer (President W. L. Bryan): The speaker of the evening is Dr. Thorndike, whose subject is, 'Individual Differences and their Causes.'

Individual Differences and Their Causes

Dr. Thorndike: Fellow teachers—I am glad to be here talking to you this evening. I could keep on talking about educational measurements and the results therefrom certainly until some time in the distant future, if Indiana would let me stay!

Tonignt we are going to take up one of the main lines of the results of these tests, measurements, and experiments which psychologists interested in the actual dynamics, the actual workings of human nature, have been making for the last twenty or thirty years, our subject being the study of individual differences in intellect, character, and skill, and their causes.

These differences in intellect, character, and skill, which differentiate one person from another,—separate off individual human beings from the average or common condition of humanity,—seem to most of you now through one or another article or book that you have read, to be obvious; and probably most of you, even before I have said anything further about them, realize at least in a vague way, their importance. Only twenty-five years ago, however, their existence was doubted, and their importance was slighted.

The older students of psychology and of Education thought in terms of 'the mind' or 'the child.' There was supposed to be a typical, average, normal, common humanity, in the likeness of which we were all very closely made. When we found divergences from this average condition, even twenty-five years ago, our men of science tended to regard these divergences as unimportant, and hide them in statements of averages, or even to regard them as erroneous and suspicious. That, I say, in the last twenty-five years, has changed. Individual psychology, tests of diagnosis, such as Professor Jones told you about this afternoon, measurements of individual efficiency, are now rather the fashion. I foresee that a time is coming when Binet will be a household word among teachers, just as Babcock is a household word among farmers, for these tests described this afternoon will be parts of our regular procedure in the life of our schools, and will be looked upon as the Babcock milk test is on the farm. Children will cry for their daily dose of Courtis tests!

In an important German book, *Individual Psychology,* published in 1911, fifteen hundred titles of studies, books, articles or monographs on individual psychology are listed. At the last meeting of the American Psychological Association there were more papers read upon tests of intellect and character in school children, in defectives, in criminals, and in other interesting social classes, than were read upon the fundamental analysis of the mind altogether.

Now that we know that these differences exist, of course, as is usual with human nature, we can see them everywhere. They seem obvious. We can think with surprise of their ever having been neglected. Common observation shows us now that human beings as a rule differ. They are not, as a rule, normal or average creatures, but they range over a wide spread of variation. The more systematic and exact observations made by men of science confirm these observations of the existence of a great variety in human nature, and emphasize its amount. Whether we take some trivial, small trait in human nature, such as memory for numbers, or ability to distinguish colors, or interest in a certain kind of music; or whether, on the other hand, we take some large field in human life, such as moral stability, or energy, or devotion, or determination, or general intellect, in all such cases we find that this wide range of individual ability is the rule.

Pictures are perhaps an easier way to illustrate and enforce this fact than words. I will take a moment or two for, first, a chart that shows the differences found amongst school children in the same school grade with respect to ability in simple column addition.

The height of this line above the base line represents the number of children. Horizontally we have a scale starting at this point, as zero, for the number of examples done correctly in a certain time, and running up to eighty at the other extreme. The average, or ordinary, or mediocre, or normal, or standard, condition might be represented by about twenty-five—from twenty to twenty-five. The number of children in each case is represented by the height of the column; but there are children at eighteen and sixteen and fifteen and ten, down to children who do not succeed in getting more than one or two examples correctly in this time. And we find, again, children running up to as high as a record of eighty, indeed higher, there being children who, in the same time that other children get no examples correctly, get one hundred examples correctly.

Again, we find that in measures of progress or improvement, in which we as teachers are more interested than in mere measures of status, the same fact obtains.

I have illustrated this by gains made from the same amount of practice in addition—ten minutes each day for five or six days, making up fifty or sixty minutes in all.

Here, again, is a horizontal line running from zero up to fifty, representing the amount of gain made by the person in the last trial, of perhaps ten minutes or five minutes a day, or something of that sort, as compared with his first. There were children here who made little gain—from zero to five examples; and great gain, from forty to fifty examples.

Again, if we look for a norm, or average, or something to represent the common ability of fourth-grade children, as these children were, we may take it as a gain of fifteen examples. But if we take any number of examples gained from fifteen to zero we should find some children representing it; and we should also find, if we took any number of examples gained, up to as high as fifty, some children representing it. Some children gain in product per unit of time, literally ten times as much as others, in the course of this school drill.

Indeed, as I shall have occasion to say later, if I have time, it is the case that the child of the most ability, who varies most widely in ability, varies also apparently in the same direction in gain; so that in the course of education the result of our school training is to increase individual differences rather than to reduce them.

This picture shows the same story here, but for one of these broader traits,—rate of progress through school.

The score is for the grade reached at the age of thirteen. It reads, 'Grade one to three and on up through the second year of high school.' This chart is not from the State of Indiana, but it will be substantially true of the State of Indiana, or any state in this country. There are children thirteen years of age in the first grade, and such children will be found who have been in that grade for six years, American born, of American parents. They are still there. Other children of the same age will have progressed to the second year of high school. Undoubtedly, somewhere in the State of Indiana, there will be one in the third year of high school, one out of twenty or twenty-two thousand.

The stock thing, as you see, was for a thirteen-year-old to be about in the fifth grade. The statistics are from 1900. We promote them a little faster now, imagining that by pushing them on more rapidly we somehow get an enormous educational advantage! This was in 1900, in the State of Connecticut. In thirteen years the average performance was to reach grade five. Some children were in four, some in two, some in one, some in six, some in seven and some in eight, and some in the first year of high school and some in the second year of high school.

These are perfectly fair samples of individual differences. I might just as well have taken them from a hundred other traits or from a hundred other groups of children.

Let us now turn to an investigation of some of the questions about the exact nature of these differences, and then later the nature of their causes. You will have noted in these charts which I have shown you that the range of variation, though great, was around a central point. There was a certain average tendency where people were very thick, and then they 'tailed off' down to extremes, where they were very thin. In technical language you say that these distributions are *unimodal*. They have one place of considerable frequency—one place where a good many people are found, 'tailing off' on both sides from that.

Now, with very, very few exceptions, this is the organization of human nature in its variations. The average is the common, the mediocre, the very frequent. Gradually, the cases fall off to less and less frequencies as we go to greater and greater extremes. It is possible that in the case of color blindness, people may divide sharply, as sheep and goats. It is possible that in a small number of other traits, that is the case; but ordinarily the fact is as shown in this chart, and is just as language does *not* show it. Our verbal accounts of facts in nature tend to classify them sharply into groups. We call things, good, better, best; we call things hot and cold; we call directions up and down; we call people intelligent or dull. We tend to group into quadrupeds and bipeds and tripeds and sextipeds and millipeds, etc.,—to group into sharp divisions, leading us to think that such divisions exist in nature with gaps between; and these notions, as for example, that children are divided into normals, children of genius, and feeble minded, with gaps between; or that children are divided into the active physically and the active mentally, with a gap between—these are amongst the most unfortunate and misleading conceptions that one can have of human nature, for the purposes of education.

Language forces us to make these sharp breaks, and to divide people off into two groups, or three groups, or four groups. The minute we get our facts and measurements about them in numerical values we realize at once that people are not tall and medium and short with gaps between, but that from tall to medium we find every grade filled, and from medium to short we find every grade filled. So also with every trait, with the exception of very few, with which school work has to deal. Nothing is more necessary for a sound conception of the classification of children or for the division of a grade, where a grade is to be split, than a recognition of this fact. In the vocational guidance of children, where you send some to industry, some to clerical work, and some to go on in educational life, nothing is more necessary than this conception of the continuity of variations of human nature from the highest grade in a certain trait to the lowest. Human nature does not fall into separate types. There is one type, mediocrity, the ordinary person, from which divergences go in all directions.

There is no reason to believe that in skill in managing men, in ability in English writing, in ability in industrial leadership, in ability in politics, or in ability in statesmanship, there is any different arrangement of human nature's varieties than the simple arrangement that we have been describing.

Now, the first study of variations in living things took place in the case of animals and plants. In the case of animals and plants these species or varieties rather stood out. When you examined an animal in order to know what to do with it, or to do for it, you looked it over and you 'sized it up' as a snake, or you placed it as a mollusk, or you rated it as an Amphibian, or the like. Then you went on and dealt with it in accordance with the rating that you had given it. Language led us to this, and our early studies of biology led us to it also in the case of human nature and of mental traits. We tended to think of these many types, and (as a result especially of this biological tendency) there grew up a doctrine of compensation, or balance, in human nature, of which you have all, at one time or another, had illustrations. For instance, most of us were taught in our early days that the blind man, because he has lost his sight, had a wonderful natural development of touch; that if a person were debarred from high mathematical ability he would probably have a large share of artistic ability; if a person were a tiptop painter, musician, or literary man, he would probably be unfortunate in making money, in keeping it, in remembering to put on his collar or get his hair cut, and things of that nature. Such was this doctrine of compensation. If you had a good mind for receiving through the eye you would be poor at receiving through the ear; if you found a child took things in well from the printed page, you should not say anything to him, since nature must have denied him the ability to understand what he got through the ears; and the like.

Just as soon, however, as the tally of measurement was applied as a test of these doctrines, the botton promptly fell out from them all. There is no known case of a good trait in human nature which has, on the average, in the long run, bad correlatives. On the contrary, a high position in one trait means a higher than average position in others, as a rule. If you are good at taking things in from the printed page, you will be better than the average in taking things in from the human voice. If you are a first rate dramatist, you are more likely to get on well with this world's goods than the average person. Shakespeare was the Daniel Frohman of his day, who 'cleaned up,' as they might have said in those Elizabethean times, the 'biggest pile' out of the stage of anyone of that day. Paderewski is not only the best piano-player in the world, but he is also the successful manager of a very large estate, and is one of the few people who can turn from professional work and not lose his money in farming, I am told. He has also put his money away, getting a very respectable rate of interest from it, so that his fortune is now one of the largest in Poland, I understand. Indiana's literary men, the Indiana school of writers of fiction, are reputed to be extraordinarily prosperous! You doubtless know them. They are your fellow citizens, and in practical affairs, even in politics and the like, they have made good their claims. Good qualities have good correlatives, and high position in one trait means a higher station than the average in the others. Understand, in all these things we are talking about the general rule. I can find literary men who are insane, and who don't know enough to tie up their shoes; but again, human nature varies so that it is literally true that almost any combination that you demand can be somewhere found in this world. The question is again of measurement, a question of how often it is found. If we begin to quote single cases, we shall simply have to let everyone quote them and count up; and in the end, when we get through counting them up, we shall find that the tally is in favor of correlation, not compensation.

In education, this principle of correlation is fundamental for thought. A person simply cannot think straight about the educational guidance of pupils, or about the arrangement of studies and the curriculum, who is possessed by this old superstition of balance. The person who thinks that ability in mathematics denies you ability in language, that ability in appreciation denies you ability in the matter-of-fact, executive work of school life, and so on—such a person will always be tackling human nature at cross purposes, will always be working against resistance; his plans will always be wasteful.

The first cause of these differences in men and women that we see about us, that naturally suggests itself to one, is the difference in the training that they have received. 'What change there has been in me,' one says, 'has been due to certain circumstances in my life, this or that book that I have read, this or that person who has taught me or influenced me, this or that occupation that I have taken up or that has been forced upon me. These are the things that have made differences in me.' That is true, but the argument is not quite sustained when we turn from the changes made in one person to the differences produced between one individual and another. Indeed we find surprisingly little evidence that the difereneces between man and man under the same general conditions of civilization—say life in America in the nineteenth century—we find surprisingly little evidence showing that those differences are produced by the different trainings that have been received. If we could take a week to relate, each one of us in this room, his or her natural history, tell what we have lived through, and then try to account for the differences amongst us by these experiences, we would find ourselves, before the week was out, turning the case right around. We would find ourselves saying, 'Well, so and so evidently had such and such a nature, and he stuck to that thing, and consequently it has left its mark on him, partly because it had a training effect upon him, but also because he stayed with it, whereas another person ran away from it.' We should find that human nature was constantly selecting, picking the kind of environment that it would let act on it. We should find that some of us, at the least touch of mechanical industry, (such as being requested to set up the stove pipe by our mother at the age of thirteen,) revolted at once, and got just as far away as we could from the mechanical problem. Any carpentering, construction or anything of that sort, we avoided as if it were the black death. Looking over our careers we find certain lacks in comparison with our fellows, and we say 'If I had had technical training—if I, as a child, had had the advantages of a manual-training high school, —then I should have learned so and so.' The real fact was that opportunities for mechanical instruction were open to us too, but that our natures were such that we rebelled; we ran to our books, and let those alone influence us. The influences on one individual making him different from another are in a large measure chosen by him.

It is also essential to take up this particular topic from a little different angle, and get some notion of the effect of the likeness of circumstances making people alike. We must try to get some notion of the effect of differences in circumstances in making people different by getting some measure of the effect of likeness in circumstances in making people alike. That measurement we can make. Suppose we should give everybody in this room for a hundred days an hour a day of tiptop instruction in mechanical art. Would the people here then become more alike in technical ability? The answer is that they probably would not. What would probably happen to us would be that those who had already a capacity for mechanical art would get more out of a hundred hours of instruction than those who are now duffers at it, and at the end of the hundred hours they would be farther ahead of the rest of us than ever.

That is what happens in such an experiment addition. The two columns at the left side of the chart represent the initial status of two groups, one representing the favored group, the other the poor group, the favored group doing about seventy-five per cent more work than the other at the beginning of the test. They were then submitted to a period of practice, everybody having just exactly the same amount of practice. In the middle of the chart are shown the gains made. The group which was originally the better of the two, made by far the larger gain, a gain of about two and a half times as much as the poorer group; so that, in the end, the pupils of the good group were further ahead than they were before. Equalizing opportunity had increased the differences. Giving the pupils just the same advantages in respect to this training in addition, far from making the pupils more alike, had even made them more different than they were before. To those that had had been given. By our training in school we do not take away from others what they do have, still we do not give them quite so much. That seems to be the rule.

The experiment indicated there was made only a year and a half ago. The first experiment made on equalizing educational opportunity and measuring its effects was made less than five years ago. We have now, by different students with different lines of work and on different subjects, several studies where certain people, different at the start, have been given absolutely equal opportunity for a certain length of time up to ten or twenty hours, and in all cases what I have illustrated here has been the rule. The people of initially high station in respect to adding, or in respect to memory work, or in respect to ability in English writing, or whatever it may be that was tested, have made larger gains; so that at the end of the experiment in the amount produced, with allowance for its quality, per unit of time, they have been farther ahead than ever, the practice having acted to increase the diversity of their achievements.

The chief competency of training in making one of us different from another within the same circumstances of life, say, in this day and generation in America, seems to be with respect to special skill and specific habits. When we come to more fundamental questions of general energy, or courage, or kindliness, or refinement, it hardly seems possible that the practice can be the main cause of the difference. If in so simple and easily-influenced a thing as addition, the effect of equalizing opportunity is so slight in reducing differences, being indeed negative, how can we expect it to have much effect with such internal and deeply founded and complex qualities as, let us say, general morals, general executive capacity, or a general stability of mind, or manliness?

Some of us have been accustomed, as a result of large interest in child psychology and the child-study movement, to attribute a very large influence in causing differences amongst our pupils in schools, to maturity. We say, 'So and so is ahead of so and so because he is matured more, has gone along farther in life's course; the inner impulse of development has progressed to higher stages in him than the other.' This cause of differences, too, is real; though here again I think educators have, somewhat naturally, a little exaggerated it. The variability, within the same chronological age, is indeed, as was suggested by Mr. Jones this afternoon, very great.

I gave recently certain tests of ability of a certain sort to twenty-seven prospective salesmen. I was asked to pick out the thirteen most intelligent men from this group of twenty-seven to be employed, the others to be discarded. These records tell an interesting story. I have a record from an eleven-year-old child that is better than the record of many in this group. That is, the difference in maturity, from eleven to adult manhood, is not enough to cover the difference of capacity within the same age.

The other story they tell is also an interesting one. These adult men had had a range of education, from a person who had completed only grade three to a person who was a graduate of one of the best colleges in this country. Now, the achievement in this general test of intellectual capacity is not at all closely related to their amount of education. The person who had completed the college course did rank high, but he also was the person who reached grade eight at the youngest age. He was good, not only because he had been to college, but because he was the kind of a person who could get through grade eight before eighteen others, and who had the ability and the will to go on through college. The relation of general capacity shown in this test to the age at which a certain grade was reached was just the same as the relation to the total amount of education received. In so far as that test can be used as evidence, it means as much for a person to be the kind of a person who reaches grade eight early, as it does for him to be the kind of a person who has a very extended total education.

More and more, as we study these differences in children and in adults, we are driven back to original differences in constitution as a major factor in their causation. One need not be in any sense a partisan of certain doctrines of heredity to admit this. It has become now substantially a mere question of measurement. Of the individuals who in the last score of years have been active in testing, trying, in school and out, to find the exact status of individuals, I don't know a single one who has not more and more come to believe in the fact that these differences are largely inherent in the organization with which we are born. We find that they run in families. Children of certain families rank very much higher in school work, in certain psychological work, (memory, perception, association, and the like,) than children of other families. If this difference was due to the difference in the family influence—in the family ambition for their children and the like—then likenesses within the family and differences between families should increase as the children grow older. The child that has been subjected to the family influence for eight or nine years longer than another should show more resemblance to his family type. As a matter of fact, however, in all my measurements we found that children at the age of ten show just as close resemblance to their families as they do at the age of fourteen. The families' products, that is, seems to differ by reason of the original natures that they endowed the child with, rather than in accordance with the special ways in which they have invested that endowment through training.

You will remember my reference to the argument concerning equalizing opportunity. That is in place here also. We cannot very much assume that differences in family opportunity are the explanation of these family resemblances when we find that equalizing opportunity produces so little effect as it does. We have consequently to admit, I think, that human beings and the individualities that they show, differ very largely by original, inborn, constitutional nature. With equal training of an inferior sort they would progress unequally—all to inferior stations. With equal education for all, of a good sort, they would still progress unequally. They would progress then to higher stations, but keeping their positions somewhat as before. Their relative achievements, the progress that they make in comparison with one another, seem largely due to the natures they are born with. Their absolute achievements, the amounts that they really progress from zero, the amounts of gain they make on what they had to start with, are of course due to the educational treatment that they get.

One might go on for any length of time in illustrating or in describing the causes of these original differences, sex, race—that is, our remote ancestry—parentage, and the variations which occur in subtle ways. All these combine to give a person at the start of life a certain nature, just as the color of his eyes and his hair, and the shape of his nose and features are predetermined in the organization of the germs which he comes from and which, at the start of life, he is. So also with his mental traits, the degree of intellect, the direction of his tastes, or the amount of skill, the extent to which he will diverge towards mastery or submission, the extent to which he will be overcome by the love of approval of his mates, or will be independent of them, living out his own life, doing what is good in his own eyes. Any quality that you may name of mind, any quality that you may name of body, seems to take up its residence in the germs which are the beginning of human life.

Of these different causes I may say that immediate ancestry is probably the largest. You are all interested I suppose nowadays in sex differences. Psychologists certainly have been, many of us, active in measuring individual differences very carefully to compare these with sex, trying to see what the differences in interest, in intellect, in purpose, and the like are that are related to the person's sex inheritance. In general they are rather slight. The last one that has been discovered is rather an interesting one, and I will tell you about it, since it is also probably the largest difference in intellectual quality correlated with sex. It is that women apparently in visual perception take in detail very much better than men. They see the detail of a total, a picture or the like better than men. This may have rather a far reaching importance. Dr. Strong, who made the measurements which show this, has pointed out that possibly the so-called failures of women in organizing large enterprises, if true—notice I use the word 'so-called' failures—are due to this necessity for them to perceive detail, to keep their minds filled with these little things. On the other hand, possibly the so-called superiority of women in tact and social address is due to the fact that they do take in small details about a person's expression, or voice, and the like that are lost upon the male entertainer.

Another difference is that by original nature men are relatively more interested in things and their mechanisms than women, while women are relatively more interested than men in people and their emotions and feelings. For example, from this University some years ago, through the kindness of some of its faculty, I got large records of the marks of students. As you may know, it is the rule that in studies like physics and mechanics boys take higher rank, whereas in studies of language girls almost universally take a slightly higher average than boys. That may all go back to this original sex difference. Mechanical toys have a potency for the the male that they lack for his sister; whereas the voice, features, the movements of the human being expressing his emotional life, have a potency for the little girl and for the woman that they lack for the male.

There are sex differences and there are racial differences. We have measured the comparative progress of negroes and whites in the public high schools in New York City, getting so far as may be a fair selection. Differences do appear, although by no means such enormous ones. The Filipinos are rather an intellectual race. The Negritos are a rather stupid one. We can make such distinctions. but apparently the uniformity and unity of the races amongst men is rather great compared with the disparity. And then in one race we have, again, an enormous range, just as we do in sex. There are plenty of men with less interest in mechanisms than women, and plenty of women that have more interest therein than a great many men do. The sexes and races overlap in a great many cases.

Probably the immediate ancestry, the ancestry for five or six generations back, is one of the largest factors in producing differences amongst individuals which mark certain ones for success and others for failure in school; which mark a certain one to be a man of art, certain others to be men of war, and certain others to be men of scholarship.

I am going to take two or three minutes to tell you a part of the story of one of the studies which have led us to this view, a study which I think has an intrinsic interest apart from its application. Dr. Frederick Adams Woods traced out, so far as he could, the ancestry of European royalty back to about the year

1200, and found out all he could about those ancestors, and gave them a rating on a scale of one to ten for intellect, one being for a feeble-minded or idiotic person, and ten representing the intellect of a Frederick William, Gustavus Adolphus, or William the Silent. He tells the story through in such a way that one can plot these people out upon a map if one wishes. You can think of each person, say, as a dot on this wall, and so arranged that he is nearest his relations; that his brothers and father and mother and sister are an inch off from his dot; that his nephews and uncles and nieces and grandparents are four inches off; and that the more remote relatives are at a further distance. If I should plot out European royalty in that way, putting a gold peg in for a 'number-ten' intellect and a silver peg in for a 'number-nine,' and a black peg for a feeble-minded one, and so on, with different colors, we should find that all the genius of European royalty was clustered around a few spots, centered in a few families. We should find, again, that the depravity and weakness and instability of European royalty was clustered within certain areas. On our map there would not be a general medley of gold and silver and black and grey, but each color would stand out with its own geography, so to speak, would have a place by itself. Indeed we can follow it out down to the present days, if we choose. Coming down to modern times we would find a certain place in the map that would do for common sense—in the fives and sixes; never in the nines and tens: never in the ones and twos—a place for a certain common-sense. level-headed, stable stock. We should find its present representative to be the King of England, well representing the strain from which he comes. We should find certain unstable, semi-insane, vacillating stocks, and one of their present representatives would be the Czar of Russia. And we should find the genius of European royalty right where we would expect to find it, because the person who does still retain some moderate portion of the blood that has produced intellectual genius in Europe is the Emperor William of Germany. Whatever we may think of him, no one will deny that he has a larger share of intellectual genius than any other living member of European royalty.

That is simply one of the studies of which there has been about a score now, all leading us to a very large respect for immediate ancestry as a cause of individual differences.

We sometimes think of men like Frederick the Great as 'happening.' 'It was a fortunate accident for Germany that he happened to be born,' we say, or, 'It was a fortunate thing for science that a man like Charles Darwin happened to be born.'' Now 'happened' and 'chance' are the last words in the world ever to use about the appearance upon this sphere of Frederick the Great, or of Charles Darwin. Frederick the Great's grandparental generation, his source of ancestry at that degree of remoteness, is one of the best ever found in European royalty—two tens and a nine and an eight, I believe. Charles Darwin's story goes back as far as his great-grandfather—his grandfather of course was the leader of science in his day, as Darwin was in his; his mother came from the famous Wedgewood stock, the makers of Wedgewood pottery. Darwin's ancestry is needed to tell the story of Darwin as well as his own work.

I have tried so far to give you samples of the sort of things that educational psychologists are doing nowadays in measuring, describing, and accounting for individual differences. I have now to say one or two things about the administrative problem of what to do about them. These remarks I will make very, very brief, simply to give you certain suggestions and to let you know that we are not simply interested in measuring these matters, but also are concerned with the significance of the facts for practical purposes. Think back to our first pictures and think of the question, 'Which is the greater evil in school work, the presence of retardation or the absence of acceleration? Which is the worst: for certain dull pupils to be held back four or five years, or for other gifted pupils to have no possibility of getting ahead four or five years?' Obviously, the second. If you get the right ones, there may be no injustice in holding a fair percentage back. But in a school where there are no specially rapid promotions, where nobody is graduated from the grammar school at eleven, where nobody has worked through the high school in two years and a half—in such a school you can be absolutely sure that you are unjust to the capacities at the upper end of the curve unless they are engaged in many other things than their school work, and are making special progress therein.

Again, take the question that most of you are somewhat interested in, the question of changing from one average standard to a certain minimum standard and then varying additional demands in accord with individual differences, so that everybody will get a certain minimum quantity of knowledge and skill, and beyond that minimum as much as fits him. Obviously, such a minimum standard plan, other things being equal, does have its advantage in the fact that it does fit these variations in the natural capacity of individuals.

Again, take the question of the problem of the distribution of education. In this democracy, for very good reasons, reasons of weight, the emphasis has hitherto been placed upon the social duty of providing a larger and larger amount of education. To teach more children and to teach them for a longer time have naturally been the two doctrines that, as publicists and reformers, we have all striven for. Now we are getting on towards the point,—a point which we haven't reached, but which we can see,—where the amount of education given can almost be regarded as satisfactory. As we approach this point we shall turn more and more to the problem of the wise distribution of education. A certain amount of education spent upon one person has a vastly different value than that same amount spent upon another. A certain boy's education somewhere in Indiana, I am willing to assent, is not only worth ten times, but is worth a hundred times the education of some other boy that I would guarantee to find in Indiana. It is not that any boy exists who does not need some education, but the distribution of education obviously must have some relation to the differences in individuals. When we have the notion of the average amount for the child which lives through certain formal phases we could then readily enough attempt to drive a thousand children like sheep down the educational highroad at just the same rate, and along just the same beaten path; but nobody, I judge, who considers frankly the great range of differences that we find would dare to assume that it could possibly be wise to give the same particular kind or amount of education to all.

Finally, though perhaps it is a far cry from our ordinary school work, still the bearing of such facts as these on what we call eugenics seems to me to deserve at least a word. Perhaps the most important question for our State, or our Nation, or for the world, is the very simple question of who is being born. Who are the people that are being born? Who are going to make the world for our children's children? Who are going to live with them in it, and make it for them, and for those who again in their turn are to be born? Probably no question has been so much neglected. It is a question that we apparently have considered improper to say anything about in the schools, improper to say anything about in the churches. This question which so vitally concerns the welfare of our children's children and other people's children's children is one that we hide away in the secrecy of scientific books. Certainly there can be no more practical question that any person can ask, and if there could be anything that the schools could do that would be of advantage—I am not sure that there is, but if there were—it certainly would be a sacred duty to perform it.

My last word is one of caution. In all that I have said I may have unfortunately left the impression of a fatalistic sort, that these differences amongst men are absolutely laid down by nature, and that consequently all our educational strivings are more or less doomed to failure; that people are as they are, and that we won't much change them. If I have, let me at once remove it in this simple way. Remember the distinction I made between relative achievement, one person being ahead of another, and absolute achievement, one person being above where he would otherwise have been. It is a distinction of enormous importance. We have seen that the differences in relative achievement, where one is in comparison with his fellow, are very largely laid down by nature; but differences in absolute achievement, differences from what he would otherwise have been, differences from what we would have been had we been born several thousand years ago in the middle of Central Africa—these absolute differences are far from being laid down by nature, being entirely within the power of education and other forms of social control.

Now, they are all that educators should really care about. What does it matter to us who is at the top? What difference does it make to us whether the person that leads his class in the Bloomington schools is of the name of William, or James, or Mary, or Jennie? The thing that is important for us is not who is at the top, but that the top should be a high one. Yet our friends, perhaps the parents of school children, are rather hard to convince of this. The ordinary person, in fact, does not much appreciate absolute welfare. This is perhaps as intelligent and cultivated and also as sagacious a group as a person could expect easily to bring together; but if I told you now to be profoundly thankful because you are not having the plague every twenty-five years or so, or because you are not all having to keep wolves and tigers away from your breakfast food in the morning, or to be thankful that your breakfast food is cooked instead of being eaten entirely raw, or to be thankful that children are not torn from one's very arms by other human savages and by wild beasts as a regular feature of our lives, I would not see any great joy manifested in this assembly, or hear any deep sighs of satisfaction arising from you. There is not one of us, really, that has ever given a decent word of real thankfulness for the enormous absolute betterment which we have over our ancestors of a hundred or a thousand years ago. What are we thankful for? Perhaps I had better not say 'we,' so I will go a grade lower and say what are our neighbors thankful for? To have a horse that can go a mile faster than somebody else's. To have more automobiles than someone else. To have a Hupmobile instead of a Ford. Choose somebody in your school and say to her mother, 'your daughter Sarah Jane is the most beautiful girl in this county. I have heard it generally agreed upon by all competent judges that she is the most beautiful girl in the county; but from any absolute point of view she is unutterably ugly and hideous. Anybody with the scale of absolute merit in mind, comparing her with real possibilities, would rate her as incredibly low.' Would that worry the woman? No. She would think you were eccentric, but since her daughter was the most beautiful girl in the county, she would not care how intrinsically ugly she might be.

Again, say to a parent, 'Your boy is at the bottom of his class; there are ten thousand boys and girls of his age in this city; he is the stupidist of them all. At the same time I am glad to be able to tell you that this boy of yours can solve problems in mathematics that the most gifted person in the world two thousand years ago could not solve—that this boy of yours is able to handle problems in applied medicine and applied electricity that no man living in this world two thousand years ago—Leonardo da Vinci, Aristotle, the wisest person you can choose, or the most learned person you could have found two thousand years ago—could handle. Still, I do, as a matter of truthful consideration inform you that he is the stupidest child in this city.' Would that parent thank you, grasp your hand and say, 'I am glad to know that Johnny is ahead of Aristotle,' and so on. Not in the least. All that parent would think of would be Johnny's position in comparison with his fellows at the time.

The eye of our irrational humanity is focused primarily on relative position. The race of the ordinary person is not really to get ahead in the world, but to get ahead of somebody else. But it is our duty as educators certainly to focus our eyes on absolute achievement, absolute betterment. It does not matter for us which person is ahead or which is behind in progress, if real progress is being made, and enough of it is being made. *(Applause.)*

SATURDAY, APRIL 18.—MORNING SESSION

[The Conference met pursuant to adjournment in the Auditorium of the Student Building, at 9:00 o'clock a.m., and was called to order by Jacob G. Collicott, Superintendent of the Indianapolis Public Schools, who introduced as the first speaker H. L. Smith, A.M., Superintendent of the Bloomington Public Schools.]

ORGANIZATION OF SCHOOL SURVEYS IN TOWNS AND SMALL CITIES

MR. SMITH: In recent years there has been an unparalleled awakening in the development of industries, inspired doubtless by the keeness of competition, but made possible only through the scientific spirit that characterizes the age. This awakening finds one of its principal outlets in the demand for efficiency and lack of waste in the turning out of the finished product. The search for inefficiency has brought to the surface heretofore undiscovered standards of measurements for determining the quantity and quality of the manufactured product.

This scientific attitude toward measurements is finding its way over into the field of Education. For some time there has been a demand for qualitative and quantitative statements concerning the product of the teaching that is being done in the several lines of common and high school subjects. Within very recent years rapid progress has been made toward lifting the estimates of accomplishment along these lines from the basis of personal opinion or subjective measurement to the more reliable plane of objective measurement. This tendency toward objective measurements has spread over many phases of the educational field including, in addition to what has already been referred to, the physical plant and equipment, the course of study, the teaching corps, and the general intelligence of the children to be taught.

The bringing together and the interpreting of the results discovered as a result of measurements based either upon personal opinion or upon objective standards, has come to be known as a survey. Judging from the numerous studies of this nature during the past four or five years and from the degree to which interest has thus far been maintained in these studies, we are justified in prophesying that the school survey will become a prolific family with a more than ordinary extension of life. From the announcements pouring in weekly concerning surveys now under way or being contemplated we can rest assured that the demand for surveys will continue to be met by a rigid multiplication of efforts. Special care, therefore, is necessary to insure against mistakes in connection with the inauguration and the carrying through of school surveys.

There are various possible motives that might operate in the inauguration of a survey. It is conceivable that a survey might be launched by individuals, or by organizations outside the schools themselves. In such cases the incentive might be retaliation on the part of enemies, opportunity to advertise the community, or a sincere desire to discover conditions as a basis for helpful and constructive assistance to the school authorities. A survey started by the school authorities themselves might have back of it the desire to discredit a previous administration, to defend themselves against present attacks, to advertise their own efficiency, or to learn in order to make improvement possible. The latter motive, whether the survey is prompted by those without the system or by those within the system, is the only wholesome and promising motive to have back of such a movement.

With a survey determined upon, the next question concerns the forces that are to make it. It may be made by outside experts and this method has in its favor the arguments that such experts are prepared to do their work quickly and that they are apt to be unprejudiced. On the other hand, they are subject to the danger of not understanding thoroughly the local conditions and of consequently misinterpreting the data. Moreover their work usually stops with a setting forth of conditions found and recommendations made. They do not usually have a hand in the inauguration of the remedies suggested for existing evils.

The survey might be made by the local school authorities including school board, superintendent, principals, and teachers. Such a survey has the advantage of being made by those who are familiar with conditions. Furthermore, it stimulates interest and creates an attitude that goes a long way toward insuring the application of successful remedies to defects found. It is the opinion of some school men that very little help can be expected from principals and teachers in such surveys. My own experience justifies me in predicting that a survey undertaken by the teaching corps as a whole will soon reveal to the superintendent that some of the accomplishments of principals, buildings as a whole, or individual teachers will surpass even his own dream of what could be accomplished. Of course some of the work thus done will certainly be carelessly done by a few indifferent or negligent individuals, but the checking up on them has a wholesome effect and frequently converts them to a more helpful attitude toward school problems. There is the danger, of course, that teachers may be overloaded and such a danger needs to be kept in mind, for the most faithful teachers will overwork rather than complain. In order to avoid the overstrain, much of the mechanical part of the work should be turned over to a competent clerk. Because of the amount of work connected with it a survey made by local school officials must stretch over a much longer period of time than a survey by outside experts. Hence where time is an important factor the local plan would have its serious drawbacks.

Where such a thing is possible, the survey should be made by a combination of factors, the local people doing the bulk of the work under the guidance of the expert or experts from the outside. Under such a combination the advantages of two types of knowledge and interest are centered on the problem.

As to types, surveys may be classified under two heads, sporadic and partial on the one hand, and continuous and complete on the other. The first type is apt to result when full dependence is put in the outside expert. Funds and time are both usually limited under such a plan. Where the whole teaching corps is inspired through the habit of shouldering the responsibility for discovering and remedying defects, the conditions are ripe for a continuous. intelligent, and complete survey, especially where the guiding and organizing hand of the outside expert supplements local activity.

Organization for a school survey depends of course upon the type of survey undertaken, the funds available, the motives back of the work, the co-operative spirit of the community and of the teaching corps. Assuming that all of the above conditions are ideal, that the schools and the community are a unit in desiring thorough and accurate information that may serve as a basis for improving the educational system, it would seem that the best organization for the work would be an organization that would combine the services of educational experts from the outside, of representative organizations or interests in the community, and of school board, superintendent, principals, and teachers of the schools. Much of the tabulation of data can properly be left to an office force created especially for that kind of work. Such an office force will be considered indispensible when the necessity for continuous, intelligent, surveying is fully realized.

THE PRESIDING OFFICER: The next address is on 'Results of Two Statistical Studies Connected with High School Supervision,' by Mr E. E. Ramsey, Principal of the Bloomington High School:

AMOUNT OF TIME GIVEN TO PREPARATION AND RECITATION IN THE BLOOMINGTON HIGH SCHOOL

MR. RAMSEY: This study was deemed advisable because of an occasional objection on the part of students, parents, and in some cases, teachers, regarding the amount of time that students were required to spend in preparation and class work. Under the poor housing conditions of the High School, it has for many years been the policy to allow students to leave at both morning and afternoon sessions at the close of their recitation work. Preliminary to this investigation, it was found by inspecting the programs that about ten per cent of the students were required to put in but five forty-five minute periods per day, and more than fifty per cent were not required to put in more than six periods per day. This suggested that it was highly probable that there was an excessive amount of home work in many cases because of the low average amount of time in school. The problem was thus reduced to one of determining the total time of preparation, and an adjustment between school preparation and home preparation, if the results of the study warranted it.

The method employed was that of the questionnaire, one of which was submitted to each student in the High School, and another to the teaching force. The former list was submitted to all students at the same time and was required to be answered at once. The list submitted to the teachers covered a week's work.

The following are the essentials in the student's list relating to individual subjects:

Name.. Date..................................

Answer ALL of the following questions as accurately as you can. Answer all time questions in minutes or in hours.

ENGLISH........................ (Here fill in the grade of English you are carrying.)

1. How long does it take you to prepare a Literature lesson?...............
2. How long does it take you to prepare a Rhetoric lesson?.....................
3. How long does it take you to prepare a theme assignment? ....
4. When do you make your preparation for English? ....
5. Rank English as hardest, second hardest, third hardest, or easiest.

....

MATHEMATICS........ (Here give the grade of Mathematics you are carrying.)

1. How long does it take you to prepare your Mathematics lesson?......
2. When do you make your Mathematics preparation?..........................
3. Rank Mathematics as in the English. ....

Similar lists were submitted in Language, History, Science, and Commercial work.

1. What do you do during period 1?..
2. What do you do during period 2?..
3. What do you do during period 3?..
4. What do you do during period 4?..
5. What do you do during period 5?..
6. What do you do during period 6?..
7. What do you do during period 7?..
8. What do you do during period 8?..
9. How many periods per day are you in recitation, laboratory and typewriting practice? ....
10. How many periods per day are you in a regular assembly? (The regular assemblies are 1, 2, 3, 5 and 6.) ....
11. How far do you come to school? ....
12. What subject requires most time to prepare? ....
13. Why? ....
14. How many subjects are you carrying? ....

The following is the list of questions and directions given to the teachers, except that the complete list covered a full week's work:

TEACHER'S LIST FOR THE WEEK OF DECEMBER 9-13, INCLUSIVE

Answer the following points as carefully and as fairly as you can. I would much prefer that the entire list be answered before there is any communication among you on the points called for, or on the purpose of the questionnaire. Please remember that you are answering these questions from the student's standpoint rather than from your own. Assign your work throughout the week in a regular way. Answer all time questions in minutes.

Report of (Subject) .... for Dec. 9. Teacher ....

Text for which these questions are answered.

1. Number pages regular text work assigned. ....
2. Time it should take to prepare this assignment......................................
3. Number pages library work assigned..
4. Time it should take to prepare this assignment......................................
5. Number of pages of permanent notes, maps, etc., assigned..................

6. Time allowed for these..
7. Amount of theme work or written report work..............................
8. Time allowed for this work..
9. Time any other assigned line of work may take..............................
10. Total time for this recitation..
11. Has this been an average week for all these lines of work?..............

To the above list was appended a supplementary list of non-general questions. They are as follows:

The English, History, and Mathematics teachers should make an estimate of time spent by students belonging to the various organizations in their respective departments, as to the amount of time per semester that must be spent by students belonging to each organization in actual attendance on meetings and in preparation for assigned duty. ....

Number of students belonging to .... club ....

English and History teachers should make an estimate of the amount of time necessary for the preparation of outside reading per semester.........

Do you make longer or more difficult assignments than you have made in other High Schools with which you have been connected? ....

If so, estimate the increased time or difficulty in percentages.................

Do you believe that the standard of work in the High School is beyond the reach of an average student .... *or that it is too onerous?*..............

Do you believe that better work would be gotten by holding students in assembly for periods four and seven? ....

All answers submitted by students bore evidence of a desire to answer fairly as was shown by the lack of wide ranges in the estimates, and by the fact that the few wide ranges could be readily explained by a knowledge of the pupils who answered in this way. But one list from the students was rejected.

The result of the tabulation of preparation time as given by students and teachers is shown in the following tables:

TABLE I. SHOWING TIME OF PREPARATION OF SUBJECTS FOR TEACHERS AND STUDENTS

SUBJECT.	1 Average Time Reported by Teachers.	2 Average Time Reported by Pupils.	3 Student's Estimate Less Teacher's Estimate.	4 Teacher's Estimate Less Student's Estimate.	5 Teacher's Estimate Varies from Average of Student's Estimate for Department.
English 1-Literature	40	54	14	....	—15
English 2-Literature	35	49	14	....	—20
English 3-Literature	43	47	4	....	—12
English 4-Literature	50	54	4	....	......
English 5-Literature	60	69	9	....	+5
English 6-Literature	50	54	4	...	—5
English 7-Literature	60	63	3	....	+5
English 8-Literature	45	51	6	....	—10
Average	42	55	....	....	......
Sum equals	....	....	....	....	—52
English 1-Rhetoric	33	51	18	....	—18
English 2-Rhetoric	55	49	....	6	+ 4
English 3-Rhetoric	45	44	...	1	— 6
English 4-Rhetoric	60	44	...	16	+ 9
English 5-Rhetoric	60	56	....	4	+ 9
English 6-Rhetoric	65	49	....	16	+14
English 7-Rhetoric	60	49	....	11	+ 9
English 8-Rhetoric	45	67	....	22	— 6
Average	53	51	....	....	.....
Sum equals	....	....	....	...	+15
English 1-Composition	55	80	25	....	—37
English 2-Composition	55	55	10	....	—37
English 3-Composition	58	69	11	....	—34
English 4-Composition	60	86	26	....	—32
English 5-Composition	60	104	44	....	—32
English 6-Composition	70	128	58	....	—22
English 7-Composition	60	111	51	....	—32
English 8-Composition	75	89	14	....	—17
Average	62	92	....	....	.....
Sum equals	....	....	....	....	—243
Latin 1	55	66	5	....	—24
Latin 2	67	52	....	15	—12
Latin 3	75	100	25	....	— 4
Latin 4	70	82	12	....	— 9
Latin 5	75	84	9	....	— 4
Latin 6	75	79	4	....	— 4
Latin 7	70	88	18	....	— 9
Latin 8	75	87	12	....	— 4
Average	70	79	....	....	.....
Sum equals	....	....	....	....	—70
German 1	44	52	7	....	—15
German 2	49	53	4	....	—10
German 3	48	53	5	....	—11
German 4	55	54	...	1	— 4
German 5	57	62	5	....	— 2
German 6	48	66	18	....	+11
German 7	58	65	7	....	— 1
German 8	67	66	....	1	+ 8
Average	53	59	....	....	.....
Sum equals	....	....	....	....	—24
Mathematics 1	76	49	....	27	+14
Mathematics 2	68	79	11	....	+ 6
Mathematics 3	47	49	2	....	—15
Mathematics 4	56	67	11	....	— 6
Mathematics 5	93	58	....	35	+29
Mathematics 6	65	67	7	....	— 2
Average	67	62	....	....	.....
Sum equals	....	....	....	....	+26
History 1	61	52	....	9	— 7
History 2	77	81	4	....	+ 9
History 3	62	53	....	9	— 6
History 4	81	78	....	3	+13
History 5	65	66	1	....	— 3
History 6	87	76	....	11	.....
Average	72	68	....	....	.....
Sum equals	....	....	....	....	+ 6
Physical Geography 1	55	42	....	13	+11
Physical Geography 2	47	45	....	2	+ 3
Average	51	44	....	....	.....
Sum equals	....	....	....	....	+14
Botany 1	52	45	....	7	— 2
Botany 2	60	63	3	....	+ 6
Average	56	54	....	....	....
Sum equals	....	....	....	....	+ 4
Physics 7	65	70	5	....	— 6
Physics 8	76	72	....	4	+ 5
Average	72	71	....	....	.....
Sum equals	....	....	....	....	— 1
Commercial History 2	59	61	2	....	—12
Commercial History 3	57	111	54	....	—14
Commercial History 4	41	73	32	....	—30
Commercial History 5	41	81	40	....	—30
Commercial History 6	46	68	22	....	—25
Commercial History 7	45	57	12	....	—26
Commercial History 8	50	47	....	3	—21
Average	48	71	....	....	.....
Sum equals	....	....	....	....	—158

TABLE II. SHOWING TIME OF PREPARATION OF SUBJECTS FOR TEACHERS AND STUDENTS

	Class.	English.	Latin.	German.	Mathematics.	History.	Physical Geography.	Botany.	Physics.	Commercial.	Combined Time for Recitation.	Laboratory.	Total Time.	Using Smaller Number as a Base, the Other Estimate Varies by ......Per Cent.
Teacher's estimate of time	9B	40	55		76		55				135	90	451	5
Student's estimate of time	9B	54	60		49		42				135	90	430	
Teacher's estimate of time	9B	40	55		76					55	180		406	0 5
Student's estimate of time	9B	54	60		49					61	180		404	
Teacher's estimate of time	9A	35	67		68			60			135	90	435	8
Student's estimate of time	9A	49	52		79			63			135	90	468	
Teacher's estimate of time	9A	35		49	68					59	180		391	7
Student's estimate of time	9A	49		53	79					61	180		422	
Teacher's estimate of time	10B	43	75		47	61					180		406	5
Student's estimate of time	10B	47	100		49	52					180		428	
Teacher's estimate of time	10B	43		49	47					57	180		376	17
Student's estimate of time	10B	47		53	49					111	180		440	
Teacher's estimate of time	10A	50		54	56	77					180		417	5
Student's estimate of time	10A	54		55	67	81					180		437	
Teacher's estimate of time	10A	50	70		56					41	180		397	14
Student's estimate of time	10A	54	82		67					73	180		452	
Teacher's estimate of time	11B	60	75		93	62					180		470	5
Student's estimate of time	11B	69	84		58	53					180		449	
Teacher's estimate of time	11B	60		57	93					41	180	45	476	4
Teacher's estimate of time	11B	69		62	58					81	180	45	495	
Student's estimate of time	11A	50	75		60	81					180		446	3
Student's estimate of time	11A	54	79		67	78					180		458	
Teacher's estimate of time	11A	50		48	60					46	180	45	429	12
Student's estimate of time	11A	54		66	67					68	180	45	480	
Teacher's estimate of time	12B	60	70			65			65		135	63	458	11
Student's estimate of time	12B	63	88			66			76		135	63	411	
Teacher's estimate of time	12B	60		58					65	45	135	108	471	10
Student's estimate of time	12B	63		65					76	57	135	108	517	
Teacher's estimate of time	12A	45	75			87			70		135	63	475	2
Student's estimate of time	12A	57	87			76			72		135	63	484	
Teacher's estimate of time	12A	45		67					70	50	135	108	475	2
Student's estimate of time	12A	51		66					72	47	135	108	479	

Table I shows the estimates by teacher (col. 1), and by pupils (col. 2). Column 3 shows the difference between column 2 and column 1, thus showing that teachers have underestimated time of preparation. Column 4 shows the difference between column 1 and column 2, showing overestimation by teachers. Column 5 shows the difference between the average for a given department and the pupil's estimate,—the minus signs (—) indicating that teachers have underestimated, and the plus sign (+) showing overestimation.

Inspection of the summaries of each department as shown in column 5 reveals that (1) English Composition shows the greatest underestimation, (2) Commercial subjects, (3) Latin, (4) English Classics, (5) German, (6) Physics, (7) Botany, (8) History, (9) Physical Geography, (10) Rhetoric, and (11) Mathematics following in the order named. It is a striking fact that Mathematics has the heaviest overestimation.

The teachers' estimates show a rather wide range of variation between departments. The largest figures are in (1) History and (1) Physics. Then follow (2) Latin, (3) Mathematics, (4) English Composition, (5) Botany, (6) Rhetoric and German, (7) Physical Geography, (8) Commercial, and (9) English Classics. Taking the highest estimates as a basis, the lowest subject, English Classics, shows but 58 per cent as much time needed for the latter subject as for Physics and History. The widest variation in the students' and the teachers' estimates exist in Composition and Commercial. Practically all other subjects are fairly uniform in these two items. Composition and Commercial occupy the position mentioned largely because of the amount of writing in both lines and speed practice in the Commercial work.

Table II shows two possible programs for each class from both teachers' and students' figures.. The striking fact is that, when summed, the two sets of results are very close together, thus leading to the important conclusion that individual departments needed adjustment rather than the course as a whole. The percentage column shows the degree of uniformity in the two results. Nine of the sixteen percentages of variation from the lowest estimate are practically negligible, while none is seriously large. Another important point brought out by this table,—but a point which no attempt was made to determine, is the amount of time a high school student should actually spend in his preparation and recitation.

A rather peculiar relation between the number who failed in their 'longest' subject is that there in no correlation between the length of subject and the failures. Hence the time of preparation reduces itself simply to a problem of the time element. Neither is the correlation between the most difficult subject and failures large at all.

It was noted above that teachers had overestimated in some subjects and underestimated in others. There in no correlation whatever between these estimates and the percentage of failure. Failures thus seem to resolve themselves into problems of the subject and not to the length or difficulty, or to the failure of either the teacher or student to estimate closely the time element.

On the question as to what subject requires the most time for preparation, the totals show that 62 per cent of Physics students rank that subject so; 44 per cent of Latin students next; 29 per cent of English students next; then follow Mathematics (26 per cent); German (19 per cent); History (17 per cent); Botany (15 per cent); Physical Geography (7 per cent); and Commercial (5 per cent). The reasons given for the amount of time required for preparation are of interest: Of the 362 students who report on this question, 173 of them speak of the difficulty of subject selected as being the cause; 68 believe that the length of assignments is the main factor; while 16 select length and difficulty combined as being the cause. No other reason assigned has any considerable number of votes. The number selecting length of assignments is indicative of the fact that was made previously, that assignments were not, on the average, too long.

All answers given in both lists have been tabulated, but the space allotted this paper precludes further discussion of these results. On the basis of the results obtained, recommendations were made to the following departments: (1). The Rhetoric assignments were somewhat overestimated by the teachers while the composition work was seriously underestimated. It was recommended that there be an adjustment between these two lines of work. (2). The work in Physics, while the two estimates of time agree closely, was deemed too heavy, and it was suggested that the work be made somewhat lighter. (3). The work in History was likewise rather heavy, and the same suggestion was made as for the Physics.

Since these adjustments have been made no discussion as to the character of the work of the High School has arisen.

An analysis of the personnel, ages, High School and College grades of nineteen Entrant Classes into the Bloomington High School beginning with September, 1903

The following report is based upon the entrant class of September, 1905, and does not include college grades for the members of this class. The study has been undertaken in the belief that a careful analysis of the data at hand in the form of records will reveal much valuable material. The local high school is peculiar in that it has three well represented groups of pupils in it at all times: (1) Graduates of the Bloomington schools; (2) graduates of the rural schools of Monroe County; (3) students whom I have chosen to call aliens, a term which includes all others besides classes 1 and 2. Among the topics to be dealt with in the study of these classes are: Withdrawals and graduates; ages of entrants; withdrawals and graduates; number of semesters these classes were in school; semester retardation; age-grade tables; period of the greatest number of withdrawals; amount of retardation by subjects; causes of withdrawals; comparison of grades of the three classes given above; comparison of grades of withdrawals and graduates; comparison of grades of German majors; of Latin majors; correlation of English Classics grades with English composition grades; correlation of mathematics grades with Physics, etc.

The material for practically all of the above points is obtainable from the school record, and gives some justification for such a thing as a record.

The class of 1905, counting those who entered from other systems before the graduation of the class, numbered 95. Of these 47 graduated, and the remaining 40 were withdrawals. Fifty-three of the entrants were city graduates, 29 were rural, and 13 were aliens. Of the latter group of 13, 2 entered the class in the Freshman year, 3 in the Sophomore year, 6 in the Junior year and 2 in the Senior year. It is at once seen that such a condition complicates the matter of instruction.

TABLE I. SHOWING ENTRANTS AND WITHDRAWALS FOR THE THREE GROUPS BY BOTH NUMBER OF STUDENTS AND PER CENTS

	Number Entering Class.	Per Cent. of in Class.	Number Graduating.	Per Cent. of Graduation (Based on Entrant Group).	Number Withdrawing.	Per Cent. of Withdrawal (Based on Entrant. Group).
City graduates........	53	56	21	40	32	60
Rural graduates........	29	31	18	62	11	38
Alien graduates........	13	13	8	61	5	39
Totals.....	95	....	47	49.5	48	50.5

Here again the city students seem to be at a disadvantage, but the same explanation holds as for the number of withdrawals. It is seen from the table that the rural students who do not graduate remain in school for full four years, one fourth of a year longer than do the rurals who graduate. Their tenacity is strong. The aliens have the least ability in this line.

TABLE II. SHOWING ENTRANT, WITHDRAWAL, AND GRADUATION AGES OF ALL THREE CLASSES

	Entrant Age.	Age at Graduation.	Age at Withdrawal.	Average Time for Graduation.	Variation from Normal Time (3.75 Years).
City students	14.75	18.58	17.92	3.83	.08+
Rural students	15.33	19.08	19.33	3.75	0.
Alien students	15.58	19.17	17.5	3.59	.16—
Totals	15.25	18.92	18.16	....	....

On first thought it might seem that the rural students have the best of the argument so far as withdrawals are concerned; while they do this in point of numbers, it must be remembered that the rural students at entrance present a much more highly selected group of students than do the city entrants, so that this condition is what might be expected.

The students who graduated varied from seven semesters to ten semesters in the amount of time taken. Four students completed the work in 7 semesters; 38 in 8 semesters; 4 in 9 semesters; and 1 in 10 semesters. The median time is clearly 8 semesters.

Of the withdrawals, 24 withdrew during the Freshman year;* 14 in the Sophomore year; 8 in the Junior year; and 2 in the Senior year. By semesters, the withdrawals are as follows: First semester, 8; second, 13; third, 4; fourth, 6,: fifth, 5; sixth, 4; seventh, 3; eighth, 2; ninth, 2; tenth, 1. It is thus clear that the Freshman year's work is the most critical point in the student's career.

TABLE III. SHOWING LOSS OF CREDITS BY GRADUATES AND WITHDRAWALS BY DEPARTMENTS

	English.	English Composition.	Latin.	French.	German.	Algebra.	Plane Geometry.	Solid Geometry.	History.	Science.	Commercial.	Physics.	
Graduates	4	....	2	...	2	3	1	2	2	....	....	1	
Withdrawals	32	4	26	...	28	40	14	6	11	15	....	1	
Totals	36	4	28	...	30	43	15	8	13	15	....	2	
Years of work represented	4	4	4	....	4	1.5	1	.5	3	1	....	1	
Failures per subject per year	9	1	7	...	7.5	28.6	15	16	4.3	15	....	2	
Average equals	....	....	....	....	....	....	....	....	....	....	....	....	10.5

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* The term year in this report is taken in all cases to be determined by 8 credits per year, actually made and not by attendance for 1 year.

Taking the number of years of work represented by each subject, it will be seen that there is a wide variation, much wider than the nature of the subjects warrants, in the subject-year failures. The mathematics work, particularly the Algebra, is the culpable subject. The Geometry work would probably have been as bad as the Algebra, however, had the heavy mortality of students (25 up to the point at which Geometry is taken up) not occurred before Geometry is begun. There is no reason why, with careful teaching, Algebra cannot be given with but a slightly greater mortality rate than Latin or English. This condition undoubtedly indicates poor teaching or 'over shooting,' which, after all, amounts to poor teaching.

These same credit losses when tabulated by years show 132 credits lost during the Freshman Year, 27 during the Sophomore year, 20 during the Junior year, and 6 during the Senior year.

TABLE IV. SHOWING RETARDATION TABLE FOR THE WITHDRAWALS BASED ON CREDITS

Semester.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
1.	1	4	1	1	2																												
2.			1	3	1		1	3	4																								
3.					1			2					1																				
4.									1			2			1		1																
5.						1	1	1				1						1															
6.													1										2		1								
7.																				1	1			1		1							
8.												2								1													
9.																																	
10.																																	

When no retardation occurs, the scores are always above the heavy broken straight line. The degree of retardation is determined by the distance to the left of the vertical portions of this line and the distance below the horizontal parts of the same line. Five withdrawals from this class were not retarded, and nine more were not seriounly retarded. Thus it appears that 63 per cent of the withdrawals may be chargeable to retardation.

TABLE V. SHOWING GRADES OF THE CLASS

	English.	English Composition.	Latin.	German.	Algebra.	Plane Geometry.	Solid Geometry.	History.	Physical Geography.	Botany.	Physics.	Averages.
Graduates—												
Latin Majors....	88.2	88.6	90.1	......	88.6	90	87.3	89.6	87.4	89	85	88.4
German Majors..	87.2	88	......	89	87.9	88.4	83.7	89.2	87	85.3	82.3	86.8
Withdrawals—												
Latin Majors......	83.2	86	86	......	83.8	84.6	78	86.4	86.6	86	......	84.5
German Majors..	88.8	83	....	84.4	84.3	86.6	....	84.6	84	84.4	77	84.1
Graduates..........	88.1	88.6	90.1	89	88.2	89.7	89.3	89.4	87.2	87	84.6	88.3
Withdrawals........	83.6	81.8	86	84.4	84.2	85.5	81.5	85.2	84.8	84	77	83.4
City graduates......	85.6	86.9	85.7	86.1	84.9	87.1	80.6	85.4	85.3	84.3	82.3	84.9
Rural graduates.. ..	87.2	88.4	91.7	89.8	88.5	91.6	88	88.5	87.3	87.8	87.2	88.7
Aliens...............	85.9	89.2	90.3	81	85	85.6	87.5	89.2	85.5	89.5	83.5	86.6

Table V contains material on the grades of the class according to various means of classifying the students. The first four lines classify on the bases of Latin and of German majors for both graduates and withdrawals. Among the graduates, the Latin majors are in the lead in every subject, particularly in the mathematical subjects and in the Sciences. The advantage in Solid Geometry and in Physics is greatest. The last three lines classify on the basis of city, rural, and aliens. Here the comparison is strongly in favor of the rural students in Latin and in all the mathematical subjects. The advantages which the Latin majors have, is evidently due largely to the presence of rural students, since the same subjects are in the lead in each of these classifications. What the cause or causes of this condition may be is uncertain; the writer believes that the two most important causes however are: (1) the selection which the rural group has undergone; (2) so far as the Latin itself is concerned, the superior teaching in Latin as compared with German; (3) the pull of the old classical idea still draws a better quality of mental fiber into the Latin.

THE PRESIDING OFFICER: The next address is on 'Use of Courtis Tests in Central School Building, Bloomington,' by Miss Mary Kerr, Principal.

COURTIS TESTS IN CENTRAL BUILDING, BLOOMINGTON, INDIANA

MISS KERR: Courtis Test in Arithmetic, Series A, consists of six one-minute speed tests and two longer tests. They are numbered 1, 2, 3, 4, 5, 6, 7, and 8. Number 1 is a one-minute test in simple addition combinations, No. 2 in subtraction, No. 3 in multiplication, No. 4 in division, No. 5 in copying figures, and No. 6 in reasoning. No. 17 is a 12-minute test in fundamentals and No. 8 is a 6-minute test in reasoning.

In scoring, attempts only are counted in the first five tests, but in 6, 7, and 8, attempts and rights both are counted.

These tests were given in Central School in May, 1911, May, 1912, and in January, 1914. Central School has all grades represented and is also the center for department work, all the 7B, 7A, 8B and 8A children in the city coming to this building.

For a year and a half before the tests were first given, considerable stress had been placed on fundamentals. The superintendent of schools gave tests in all grades, and results were given to teachers. Comparsions revealed strong and weak places, and teachers became interested in bringing their classes up to the standard set by others.

By graphing on the Courtis standard, the results of 1911 we found that we were slow in Tests 1, 3, 5, and 8, standard in some grades in Test 7, above in some and below in others. There was no steady line of progress from grade to grade in any ability measured.

During the year, 1912, we attempted to remedy the defects as shown, putting still the main stress on fundamentals. The graph for test given in May, 1912, shows that a considerable gain had been made in speed subtraction in the department, a loss in lower grades; in multiplication, a gain in the department, about the same below; in division, a gain in the department, a loss in lower grades. In speed copying, the 1912 line shows a more steady advance from grade to grade, except in the department which is considerably below standard both years. In test 6, there was a considerable loss in all grades when compared with 1911, and we were below standard both years. In test 7, a marked improvement was made over 1911 and steady progress from grade to grade. We were well above the standard in test 8.

In general, these results revealed that while we were not so speedy as the Courtis Standard in most of the simple combinations, yet we were far above the standard in the lower test, No. 7—fundamentals, and much too slow in Test 6—speed reasoning. The development of reasoning ability is so complex a thing that we hardly knew how to approach the problem. We felt we could be making no mistake, however, in suggesting to all of the Arithmetic teachers as one aid in this direction, that more time and attention should be given in all classes to the reading of problems and helping children in interpretation of problems. We had some of this kind of work every day in class. The teacher also read simple 'thinking' problems every day for quick work.

The graph for January 1914 shows in general:

1. That we have been able to maintain the standing of previous years in fundamentals.
2. That in speed reasoning we have made considerable gain, not only in number of problems solved but in accuracy. The range in accuracy in 1911 was from 56 per cent to 95.3 per cent, in 1912 from 61 to 87 per cent, in 1914 from 85 to 96.5 per cent.
3. That there is more steady progress from grade to grade.

All of the above comparisons are based on class averages. And it is important that we should know, as we do, where we stand as a school when compared with other schools and where we stand from year to year as compared with ourselves.

But we must not ignore the equally important fact that these averages do not reveal the individual differences within a group, nor the differences of groups within a school, nor the differences of groups within the same grade. These last differences may well be shown in our 7A grade. The total number of pupils in 7A was 91, divided into four sections, numbered 5, 6, 7, and 8. These children were grouped according to general ability as well as we are able to determine it. The following table will show the average and variability of each of the sections in Tests 6 and 7. Section V is an irregular group, made up chiefly of over-age boys. Section VI is the strong group. Section VII is the medium group. Section VIII is the slow group. These figures are for the second semester, 1913-14.

TABLE SHOWING AVERAGE AND VARIABILITY OF SECTIONS OF 7A GRADE

SECTIONS.	Number Taking the Test.	Average Age Sept. 1, 1913.	TEST VI.				TEST VII.			
			Attempts.		Rights.		Attempts.		Rights.	
			Av.	Var.	Av.	Var.	Av.	Var.	Av.	ar.
V.—Irregular........	16	13-5-14	4 9	20	4.2	24	12.7	13	7.9	25
VI.—Strong..........	25	12-5-22	5.3	17	5.1	20	13.1	16	9.3	27
VII.—Medium........	25	12-6-15	4.8	17	4.1	30	12	17	7.8	26
VIII.—Slow..........	25	12-7-22	4.7	17	4	20	12.8	16	7.5	20
Courtis Standard....	....	....	5 6	......	4 5	.....	12.5	......	8.2	

The range of abilities within a group is shown by a glance at achievement of 4B's and 8A's, the lowest and highest grades in which the test was given, in Test 7, fundamentals.

The 4B range in attempts was from 3 to 16.
The 4B range in rights was from 0 to 8.
The 8A range in attempts was from 9 to 19.
The 8A range in rights was from 3 to 17.

This means that in our 4B grade there are children who in the abilities measured here, range from first to 7th grade, and in our 8A grade are pupils from 4th to 12th grade ability.

Again this means that all through the grades are children who are far below standard in these abilities, and children who have as great or greater ability than expert accountants.

How to make all children attain standard ability without such overtraining to the few is one of the problems we must yet solve.

We are convinced that a uniform class drill, instead of remedying individual defects will rather strengthen the strong pupils in the places where they are already strong and will not help the ones who need help.

In section 6, our strong group of 7A's there are 4 boys, Raymond, Charles, Paul, and Karl. Raymond is 5th grade ability in speed combinations and 5th grade in fundamentals. Charles is 4th and 5th grade in speed combinations, but 8th grade in fundamentals. Paul is high school in speed combinations and high school in fundamentals. Karl is 7th to high school ability in speed combinations, and 6th grade in fundamentals. Suppose we drill on simple combinations in this section. Charles would probably gain in speed combinations, but would almost surely lose in fundamentals. Paul does not need such drill; he is already above his class standard. Karl does not need such drill; he is above. It is a question whether Raymond would be benefited. His speed in the tables might be increased without any gain in fundamentals.

This surely means that each teacher should have some definite measure whereby to determine the exact needs of each child. She must be able by using such measure to diagnose carefully each individual case, and some one in the near future must devise a scheme by the use of which we can still have group instruction, but at the same time help each child where he needs help until he has attained standard ability in these fundamental processes.

In conclusion, I feel sure that the Courtis Tests have helped to reveal to us many of our needs. They have shown us the wide range of abilities in the simple fundamentals processes. They have furnished a means of measuring the effect of certain drill methods. They have pointed clearly to the need for individual help for the individual child, and reveal just where he needs the help *(Applause.)*

THE PRESIDING OFFICER: The next speaker is Professor M. E. HAGGERTY, Ph.D., Associate Professor of Psychology, Indiana University, whose subject is 'Elementary Teachers and Co-operative Research.'

ELEMENTARY TEACHERS AND CO-OPERATIVE RESEARCH

PROFESSOR HAGGERTY: Mr. Chairman, ladies and gentlemen—Two years ago Mr. Smith, the Superintendent of the Bloomington Schools, came into the laboratory during the summer, and we became interested in trying out a number of old experiments in the matter of speed and accuracy in addition. We divided the group of, I think, twenty students into two sections, and one group we urged to add as rapidly as they could, regardless of any desire to obtain accuracy. The other group we urged to add as accurately as they could, regardless of any desire to get speed. There were individuals in each of these groups who gained in speed. There were individuals in each group who gained in accuracy. There were individuals in each group who did neither. It occurred to us that a fair hypothesis might be that there is a speed for every individual at which he can do his most accurate work, but that this is not the slow speed. That is to say, if you slow an individual down he will do less accurate work than if you allow him to go at a faster rate of speed. These are not new psychological ideas. In order to test them, however, we decided to try out the experiment on the public school children. We arranged to divide them into three groups. I think there were about seven hundred and fifty in all, and we arranged a practice period of five minutes per day for each of these groups. One group we told to make speed. The other group we told to be accurate. The third group we told to make speed and be accurate. Two weeks after the close of the practice test, we gave an additional test; and two weeks later another test. We are not as yet ready to give a final statement of these results.

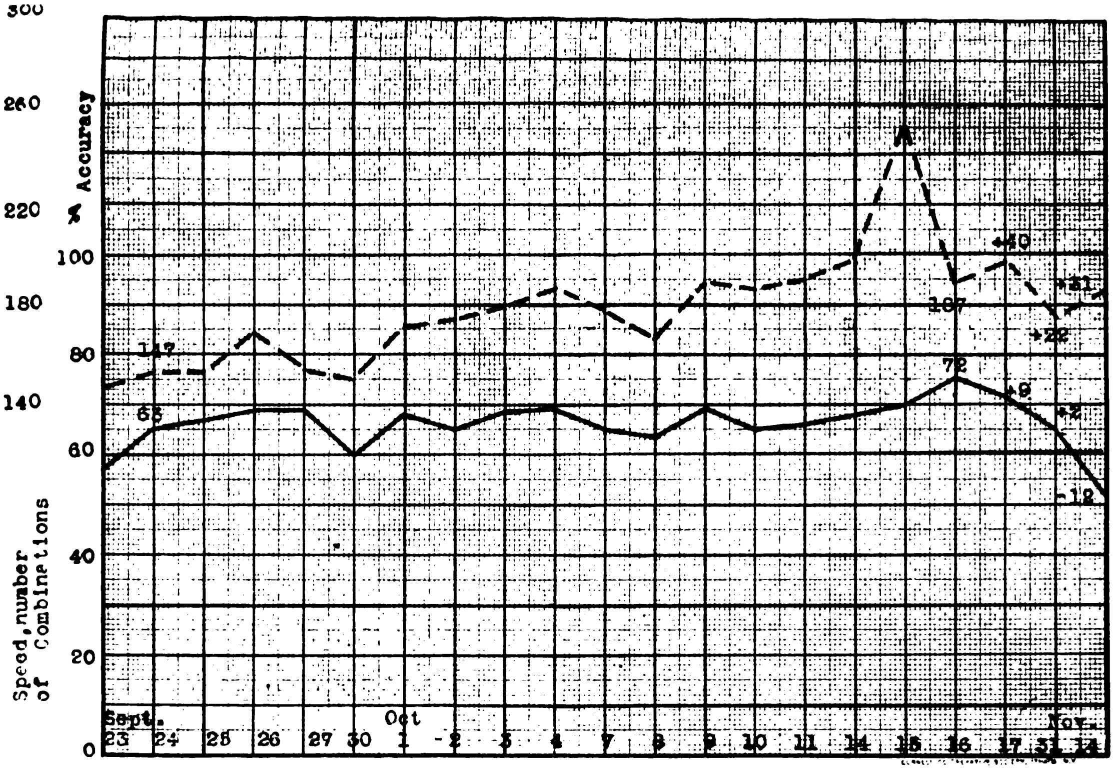

Fig. 1.—COMPOSITE CURVES. ALL GRADES. Instructions: ACCURACY. All Males and Females who **GAINED** in ACCURACY. 52 Individuals. Accuracy ________ Speed ________

Notations on second ordinate are averages for first 3 days.
Notations on ordinate for Oct. 16 are averages for last 3 days.
Notations on ordinate for Oct. 17 are gains or losses of last 3 days over first 3 days' average.
Notations on ordinate for Oct. 31 are gains or losses made on test given two weeks after practice ended, over average of first 3 days.
Notations on ordinate for Nov. 14 are gains or losses made on test given one month after practice ended, over average of first 3 days.

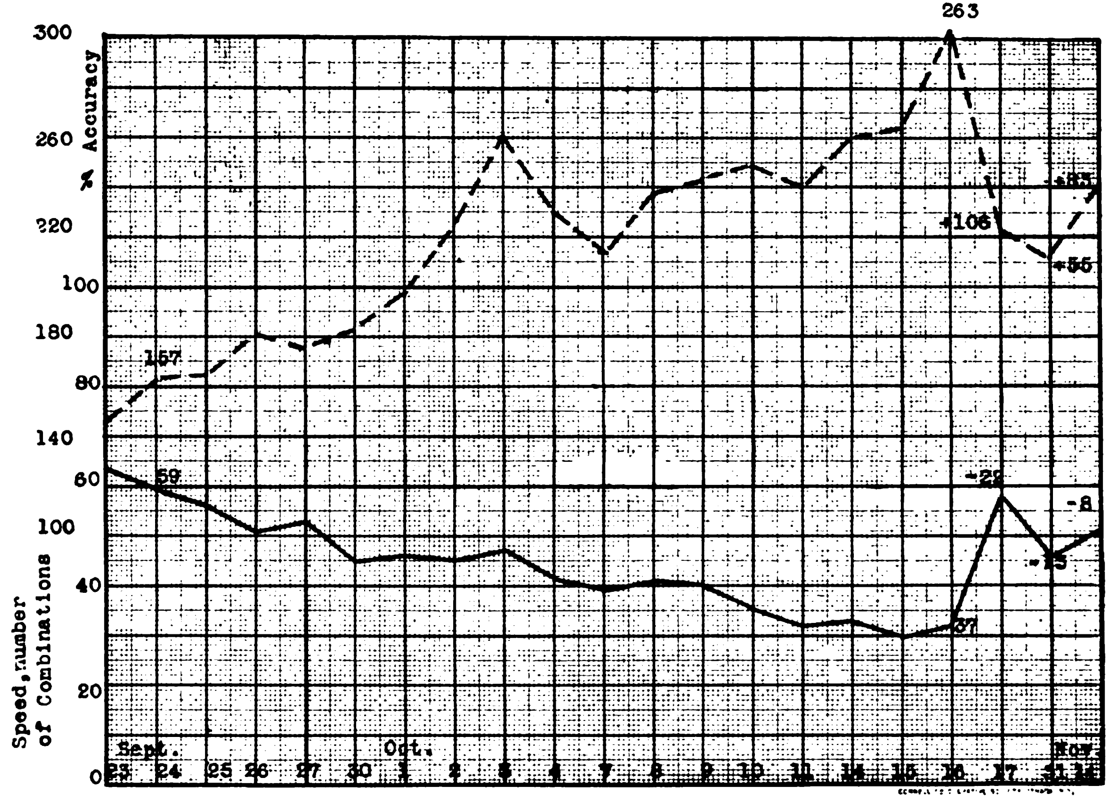

Fig. 4.—COMPOSITE CURVES. ALL GRADES. Instructions: SPEED. All Males and Females who **LOST** in ACCURACY. 94 Individuals. Accuracy________ Speed________

Notations on second ordinate are averages for first 3 days.
Notations on ordinate for Oct. 16 are averages for last 3 days.
Notations on ordinate for Oct. 17 are gains or losses of last 3 days over first 3 days' average.
Notations on ordinate for Oct. 31 are gains or losses made on test given two weeks after practice ended, over average of first 3 days.
Notations on ordinate for Nov. 14 are gains or losses made on test given one month after practice ended, over average of first 3 days.

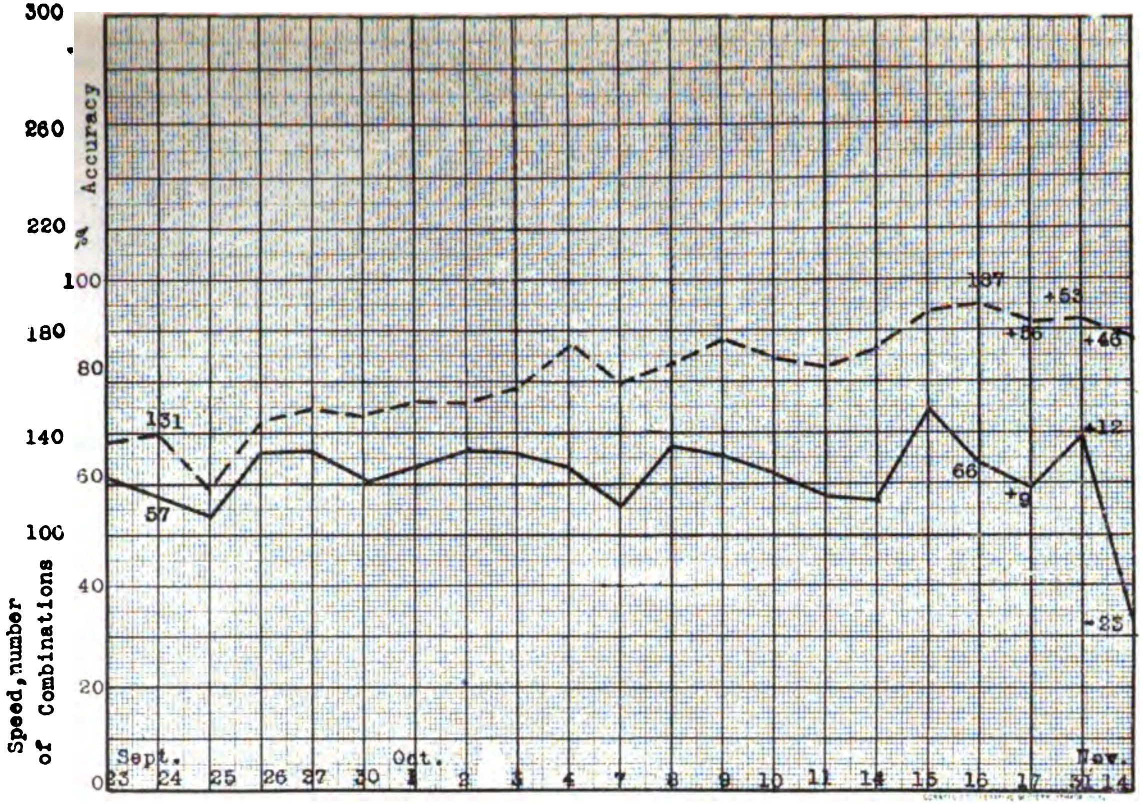

Fig. 5.—COMPOSITE CURVES. 7B, 6B, 4A, and 4B GRADES. Instruction: GENERAL EFFICIENCY. All Males and Females who **GAINED** in ACCURACY. 52 Individuals. Accuracy ———— Speed ————

Notations on second ordinate are averages for first 3 days.
Notations on ordinate for Oct. 16 are averages for last 3 days.
Notations on ordinate for Oct. 17 are gains or losses of last 3 days over first 3 days' average.
Notations on ordinate for Oct. 31 are gains or losses made on test given two weeks after practice ended, over average of first 3 days.
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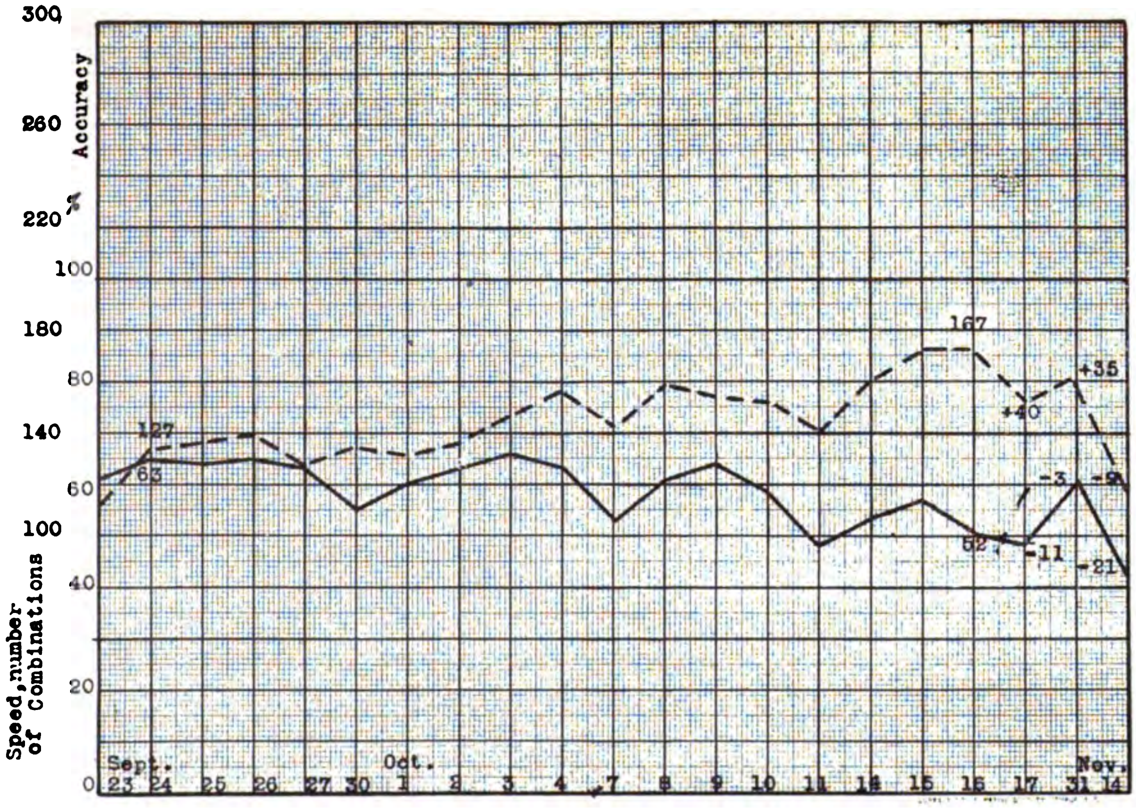

Fig. 6.—COMPOSITE CURVES. 7B, 6B, 4A, and 4B GRADES. Instructions: GENERAL EFFICIENCY. All Males and Females who **LOST** in ACCURACY. 31 Individuals. Accuracy__________ Speed__________

Notations on second ordinate are averages for first 3 days.
Notations on ordinate for Oct. 16 are averages for last 3 days.
Notations on ordinate for Oct. 17 are gains or losses of last 3 days over first 3 days' average.
Notations on ordinate for Oct. 31 are gains or losses made on test given two weeks after practice ended, over average of first 3 days.
Notations on ordinate for Nov. 14 are gains or losses made on test given one month after practice ended, over average of first 3 days.

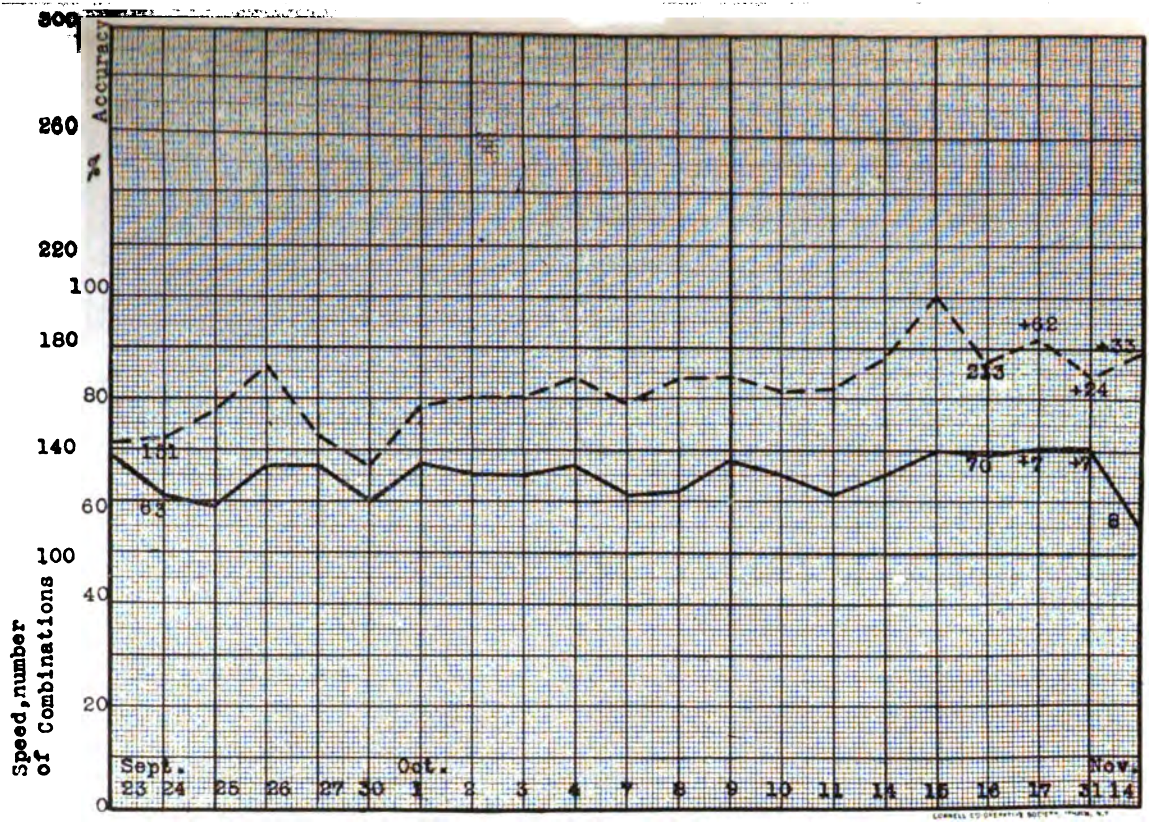

Fig. 7.—COMPOSITE CURVES. ALL GRADES. All instructions. All Males and Females who **GAINED** in ACCURACY. 237 Individuals. Accuracy________________ Speed________________

Notations on second ordinate are averages for first 3 days.
Notations on ordinate for Oct. 16 are averages for last 3 days.
Notations on ordinate for Oct. 17 are gains or losses of last 3 days ovre first 3 days' average.
Notations on ordinate for Oct. 31 are gains or losses made on test given two weeks after practice ended, over average of first 3 days.
Notations on ordinate for Nov. 14 are gains or losses made on test given one month after practice ended, over average of first 3 days.

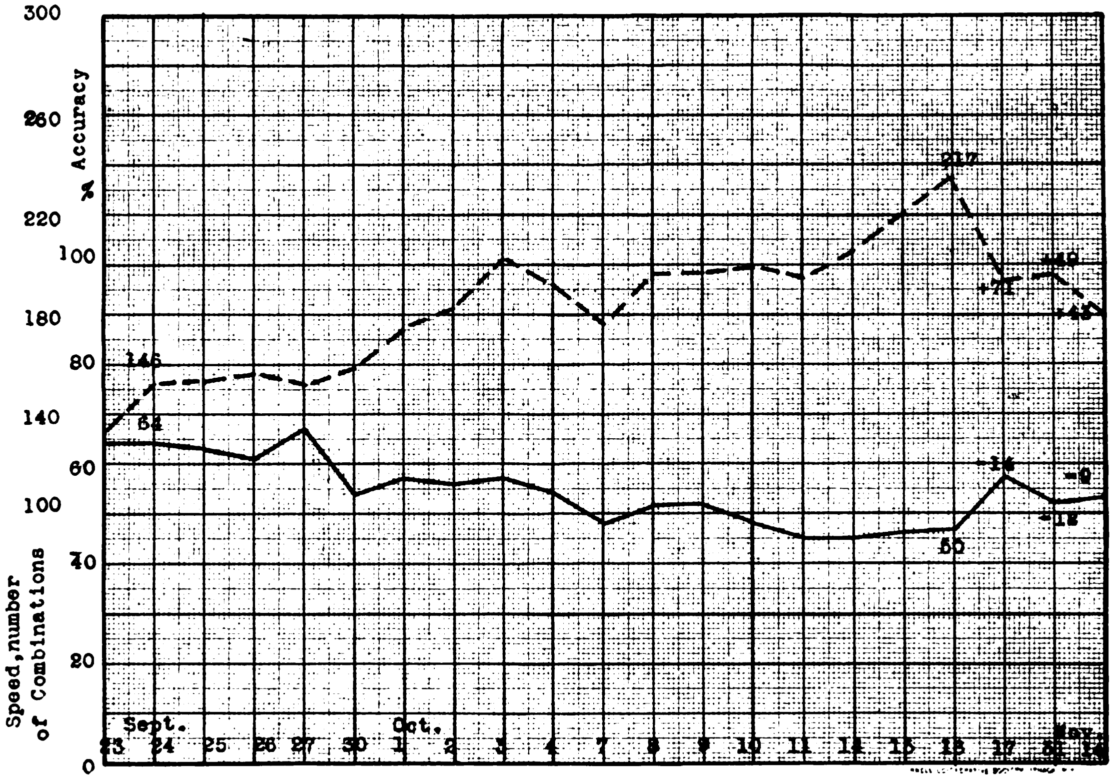

Fig. 8.—COMPOSITE CURVES. ALL GRADES. All instructions. All Males and Females who **LOST** in ACCURACY. 186 Individuals. Accuracy________________ Speed________________

Notations on second ordinate are averages for first 3 days.
Notations on ordinate for Oct. 16 are averages for last 3 days.
Notations on ordinate for Oct. 17 are gains or losses of last 3 days over first 3 days' average.
Notations on ordinate for Oct. 31 are gains or losses made on test given two weeks after practice ended, over average of first 3 days.
Notations on ordinate for Nov. 14 are gains or losses made on test given one month after practice ended, over average of first 3 days.

One thing is, however, perfectly evident, and that is that the children fall into at least two groups, and probably many groups, as determined by their reactions toward a fixed situation like this. There are those in each of the three groups who improve in accuracy. In each of the three groups we find those who lose in accuracy. In each of the groups we find those who improve in speed and those who lose in speed.

Now, I think I had better not say much more in the way of interpreting our results than just this—I think that we may be able to find, by a study of the individual curves, the point at which an individual who is going to lose in accuracy begins to lose in accuracy; and as we know pretty fairly the conditions under which these tests were made, we may be able to put our finger upon some of the difficulties which were in the way of these people who lost, and may indicate something about what could be done under circumstances of that sort.

The point I wish to make by calling attention to this study is this: that I do not know of a study which was made under more rigidly experimental conditions on as large a number of children as was this experiment. It was not, however, made by expert psychologists, not made by persons who have any great amount of training in psychology. It was made by school teachers who were then teaching in the Bloomington public schools, and under adequate supervision, any group of teachers might make this kind of a test.

Before passing, I would like to call attention to a chart which has some interest in connection with this study, on the effect of instructions. Mr. Wellons undertook to study the effect of encouragement and discouragement on the ability to add. He took six individuals separately and gave them this same kind of an addition test. At first he said nothing except 'add these columns.' They added and he kept the record in time. This continued for several days. When he had got a fairly satisfactory record, so that the practice effect had ceased to show itself, he said to these individuals, 'You didn't do as well yesterday as you did the day before.' This was repeated for several days. Then he said to them, 'You did better yesterday than you did the day before.'

The results of these tests are represented on this chart. The tests were given first to six college students, then to six high school students and finally to six grade students. The results under neutral instruction, which was merely to add, you find represented on this chart, which shows a coefficient of three hundred and twelve. The negative instruction shows a coefficient of two hundred and sixty-six. The positive instruction is represented by the coefficient of three hundred and sixty-two.

TABLE SHOWING EFFECTS OF INSTRUCTIONS ON EFFICIENCY IN ADDING

THREE INSTRUCTIONS.	Average Efficiency.
Six college students—	
Neutral	.312*
Negative	.266
Positive	.362
Six high school pupils—	
Neutral	.175
Negative	.167
Positive	.191
Three grade pupils—	
Neutral	.149
Negative	.146
Positive	.188

*Compounded of speed and accuracy. (Wellons.)

In the case of the high school pupils you have the same effect; that is to say, the neutral instruction gives you a certain grade. The negative grade there is considerably lower than that. The positive instruction brings it decidedly higher.

In the case of the grade pupils you have the same thing. although the negative instruction did not have quite the same degree of effect. The neutral instruction there was a hundred and forty-nine, the negative a hundred and forty-six, and the positive instruction a hundred and eighty-eight. If that ratio, however, should be constant throughout a school system it would materially determine the efficiency of that system.

I wish now to turn to a second point. Last autumn Mr Smith asked me to go to one of the school buildings to assist at the teachers' meeting. I went with a bald question, asked very broadly, because I knew no answer to it except the vaguest kind of an answer. The question was 'What ought you to know about a boy in order to suggest to that boy what he ought to do in life?' We spent an hour and a half together with a group of ten teachers thinking of all the things that we ought to know about that boy. I do not now remember all of the things mentioned, although I have a list which extends over several pages. I remember that these things came out: You ought to know the boy's educational record; a perfectly easy thing to get. Another thing you ought to know about a boy is his health, and in the Bloomington schools you can get this record. You ought to know something about the boy's vocational history, it was said. That is, you ought to know what things this boy has done in his past life, up to this point, in the way of actual occupation; you ought to know his vocational ancestry, and that, of course, suggests the whole problem of his heredity. It was suggested that you ought to have some kind of character analysis of the boy, and this last was the problem upon which we finally decided to study.

We wished to have some scheme for making a character analysis. We collected adjectives that could be used to describe a boy or girl, and made a list. We collected other lists from various places, and then we sifted and rearranged these lists, and as a result we had three groups of qualities. We had first a group which we called 'individual qualities'; second, a group of 'social qualities'; and then, in addition to these, we made a third group which we called 'most important qualities.' The teachers then offered to grade ten children in their schools. Each of these children was graded by about five teachers, so that each record which we have is a composite record of the judgments of four, five, or six persons.

The scale, as it has been revised, after that grading and after certain other gradings which were made, is represented here under the title of a human measurement scale.

HUMAN MEASUREMENT SCALE

METHOD OF GRADING—

The subject should be graded on the quality indicated by the underlined word. The words in parentheses are variants, kindreds, and opposites. If any one of these is more accurately descriptive than the scale word it may be underscored. The grade should be made on the basis of eleven points. If the subject appears to you as normal, i. e., as not strikingly defective in the group of qualities concerned nor as possessing them in an unusual degree, give a grade of 6. Then grade above or below 6 for variations from this standard. (Place grade on left margin.)

SCALE

1. Honest (sincere, frank, conscientious, candid, fair-minded, truthful).
2. Industrious (thorough, painstaking, persistent, enduring, lazy, sluggish, indifferent, superficial).
3. Attentive (observant, alert, active, ready).
4. Cheerful (hopeful, buoyant, enthusiastic, morose, irritable, complaining, optimistic, pessimistic).

Here again you get a perfectly true and perfectly definite differentiation of people on the basis of this scale. I would not say anything about the great importance of this, because I don't know how important it may be; but we have gotten a further scheme in mind. Suppose that you knew what were the important qualities in any occupation, let it be advertising, medicine, the law, farming, whatever it may be; suppose that we could determine, for instance, for any specialist in any occupation of this sort, what are the four, or five, or six important human qualities necessary for that occupation? It would be perfectly easy then, if those qualities were really constant conditions, to give a pretty fair prediction about what that individual might do in a particular occupation.

The other thing that I intended to say, and which I shall not have time to say, was in reference to another group of teachers in another school building in this city where we went in with this question, 'How much initiative do your children have?' 'How much thinking do your children do in the school room during the hours that they are with you?' That, of course, raised the problem of what initiative is, from a psychological point of view. This we considered at some length. We decided to take Dewey's classification of the aspects of thinking and classify different cases of initiative.

We thought, first of all, we would gather the cases of initiative from different school subjects and arrange them into an initiative scale. That was not satisfactory. We then decided to collect cases in each subject. As a result, we have now gotten a scale, not satisfactory by any means, in detail, but which we hope can be improved, in reading and geography; and our idea is that when we have finally determined it we can go into either of the school rooms and give an estimate of the amount of actual thinking that is done during the day in either of these school rooms.

My object in referring to these studies is not to give you any important bit of psychological education—the study is too new for that—but to bring this truth to you, that if we are going to get at the facts of education, we have got to have the closest cooperation of the teachers. I want also to say this other thing. that I know that the teachers are capable, and, as we have found. entirely willing to undertake this particular work. *(Applause.)*

THE PRESIDING OFFICER: We have fifteen minutes for discussion. For the benefit of those who are to take part in the discussion I would like to take advantage of 'suggestion,' and say that

the speakers we have heard have done very well, but you can probably do better. *(Laughter.)*

If you want to ask a question, ask your question of one of the four speakers. If you wish to take part in the discussion you have one minute.

PROFESSOR CHILDS: Mr. Chairman, I would like to ask Dr. Haggerty if the results of any of these investigations are now available, or will be?

PROFESSOR HAGGERTY: They will be, but they are not as yet.

PROFESSOR CHILDS: I would like to ask what use is made of the list of adjectives?

PROFESSOR HAGGERTY: We worked them into the scale which we have copies of here, and which you may have.

I will not defend this scale. It was based in certain parts upon what we thought were good reasons, and in part on the fact that we thought we would just do it that way. It is a perfectly easy thing to find fault with, but that is not the point; we want it tried out.

I may say that our plan is to grade four hundred children on the basis of this scale, and follow those children up to see what becomes of them, if we have an opportunity to do so.

We also made a rather crude study of the interests of the ten children, and I asked the teachers then, on the basis of this study and on what they knew of the educational grades of these children, and on the basis of their knowledge of their home life and their heredity, to make a prediction as to their future. These predictions we are not publishing now. We have them. We are going to have them sealed away and opened up about twenty-five years from now to see how true they were.

THE PRESIDING OFFICER: Is there any other question? We have five minutes yet to devote to this subject.

MR. SCHOLL, of Rushville: Mr. Chairman, I would like to inquire, are the new Courtis tests ready for distribution?

DR. COURTIS: Yes, the tests were ready in September. They have been used by Boston and Detroit and a number of cities around the country. From those, tentative standards have been derived, and are now being printed; but I am especially after a test at the end of the year, to get the final product. We should be glad to have the co-operation of anybody in that line of work to give the tests at the end of the year on the little duplicates which are provided, so that you may keep one set and send one set to me. Those tests are sold at cost, and you can get them from me by writing to me at Detroit.

MR. SCHOLL: Mr. Chairman, I would like further to ask Dr. Haggerty if he cannot give us a list of those six or seven qualities that he suggested as the scale for human measurement?

PROFESSOR HAGGERTY: I will read them. The first one we put down was honesty. The second is industry. The third is attention. The fourth is cheerfulness. The fifth is loyalty. The sixth is courage. The seventh is prudence. The eighth is efficiency. The ninth is inventiveness. The tenth is adaptability. The eleventh is sympathy. The twelfth is self-assertion. The thirteenth is tact. The fourteenth is quarrelsomeness. The fifteenth is jealousy. The sixteenth is suggestibility. The seventeenth is emulation, and the eighteenth skill.

For practical purposes this can be perfectly well reduced to ten points, or even fewer, but for the purpose of experiment we wanted to have at least as many as this.

MR. SCHOLL: Some one near me wants to have a little more definite information as to just how you attempted to get at the amount of initiative in a class room.

PROFESSOR HAGGERTY: I have on the end chart there the forms in which initiative may occur as suggested in Dewey's book. What we tried to do was to get the teachers to watch for cases of initiative in their rooms. Now a teacher who is not accustomed to do that, of course, finds it very difficult, and often overlooks cases. I have no doubt hundreds of cases of initiative occurred in these school rooms which were not reported, because the teachers were not accustomed to study the children from that point of view. The teachers generally are accustomed to teaching reading, writing arithmetic, geography and grammar. If you ask them to study the children, it is a great alteration in their point of view, so that it takes a good deal of time; but we have had some excellent cases reported by the teachers. I think, in all, we have probably had a hundred cases reported by these teachers. At times Mr. Smith has gone in and I have gone in and called the teacher's attention to a particular case, but we never reported them ourselves. The cases are always written up by the teacher.

The Presiding Officer: The next subject on this morning's program is, 'What the University Can Do for the Elementary and Secondary Schools of Indiana,' and Dr. Book is the first speaker. Dr. Book is Deputy State Superintendent of Public Instruction. Dr. Book has ten minutes; the other speakers five each.

ROUND TABLE—WHAT THE UNIVERSITY CAN DO FOR THE ELEMENTARY AND SECONDARY SCHOOLS OF INDIANA

Dr. W. F. Book: Mr. Chairman, ladies and gentlemen—In opening this discussion on the topic, 'What the University Can Do for the Elementary and Secondary Schools of the State,' I shall try to mention only three things that seem to me to be of first importance. All of these things, I believe, are possible, and of great importance to all interested in educational affairs in the State. There will be no time for elaboration or illustration of these points, but a mere mention of the points I trust will suggest their importance. The first thing that can be done to help the elementary and secondary schools of Indiana is to bring to the University a group of men scientifically trained, real educational experts, who have the interest to actually take up the educational problems which confront the school men in this State, and who have the ability and training to solve these problems in a permanent way. The importance of a university taking a hand in solving real educational problems is well illustrated by the results which Dr. Thorndike is giving us in this conference on educational measurements.

We are indeed fortunate that we have in this country a University which has provided the means and has brought to its borders a group of men who have worked out with such a remarkable degree of success some of the problems that lie at the very basis of educational science. This work has already put certain phases of the elementary and secondary school work on a sound scientific basis. But educational measurements is only one field of educational research. There are a great many other important problems connected with education that ought to be worked out. I shall mention just a few, and I haven't time even to illustrate these various fields of educational research.

There is, for example, the field of child hygiene. Nothing is more important than to determine the conditions which favor or retard a child's ability to learn, the conditions which help or hinder its growth and development. We must not only measure the child's progress and diagnose his case to see where the trouble is in the business of learning and development; we must find out how to make the conditions favorable so that the kind of learning and development which we wish to stimulate can take place naturally and economically. There is a whole group of problems in this field of child hygiene which are as significant and extensive in their scope as the problems in the field of educational measurements, which have been so clearly and ably set forth in this conference. It may even be argued that the problems in this field of child hygiene are even more fundamental than those we have been considering in this conference. To say the least it is important to have men work in a scientific way to determine the facts and principles that govern physical and mental development, because, after all, these lie at the very root of our educational work. It should make us blush to have to say, as we must say, that we do not know how children actually learn anything; that we do not know the conditions that are most favorable for bringing about the changes which Education seeks to make. We, therefore, need men in the University who will devote their lives to the study of the problems in this field, men and women who can give us the facts in this field needed to put our work on a scientific basis.

Other problems needing investigation are those in the field of school organization and administration. The problem of the subnormal child, of the bright child, detecting and learning to administer properly to the needs of the child with special talents and abilities, and a great many others that I might mention. We need at the Universities of this country men trained for this work; men who are given opportunities to study these problems in a scientific way and who will devote their time to the problem of placing the work of Education on a sound scientific basis; men who take as keen an interest in this field of work as scientists do in any field—all to the end that you men who are doing the practical work of eduation may be given the facts needed to make the educational work truly efficient and professional. This is my first point.

My second point is that a University can and should do a new kind of extension work. I mean that it should provide the means whereby the men who are investigating educational problems and putting Education on a sound scientific basis may go to a group of men and women doing the actual every-day work in Education and help them work out the actual problems that confront them The scientists must give scientific advice to the workers in the field, bringing the science right down to the problems with which you and I must deal, as has been indicated in one field of school work in this conference. Theory and practice, science and its application, must go together. The best way this University can help the elementary and secondary school work of the State is to provide the services of trained men who are interested in helping us work out the problems that we need most to have solved and that we cannot solve ourselves. This aspect of the work, getting scientifically trained men actually in touch with the problems that confront us, and working them out with us, enabling us to get the advantage of their expert scientific training and interest, represents the second way in which the University can help to advance the cause of Education in the State.

The third important line of work that I had in mind for the University to do is that it should provide the means for giving a real professional training for the vocation of teaching and for the profession of Education—a training that will actually fit teachers and superintendents for the work they are to do. I don't know what you think about it, but I believe there is no field of work that offers the opportunity for service that Education does, provided only that we do our work as it should be done. One of the functions of the State University is to provide vocational training for teachers and educators. This problem has not been solved. We have been going at the matter of training teachers from the wrong end. We need to make a careful study of the actual needs of this occupation. We can never find out how to help the superintendent and the teacher as long as we sit in our offices and map out courses of instruction for teachers in accordance with our fine-spun theories and with tradition. We must go direct to the profession itself to find out what is needed, go to the school room to find out what it takes to succeed there. We must begin with the problems which the teacher and superintendent are actually called upon to solve and shape our instruction so as to meet effectively these needs. In the matter of reorganizing the teachers' training work, the University, I think, can be of great service. It must take the lead. It should get in touch with the workers out in the field, find out the problems these workers are called upon to solve, then direct the teachers' training work at the University in a manner so as to give this needed help. This sort of vocational training for teachers, principals and superintendents represents a third important way in which the University can assist in helping the elementary and secondary school work of the State.

I take it that this was the thought which the committee had in mind when they put this topic on the program. They wished to find out from the men and women actually engaged in the school work of the State some of the problems that the men here at the University might help solve; to find out from you how far the present vocational training of teachers is a success; to find out from you what should be done to make the teachers' training work more effective. They want to know from you what problems you need to have solved. I hope you will tell them. They need your co-operation and help. I, therefore, hope that the speakers who are to take part in this discussion will point these things out to the University in a clear and specific way. We must work together on all these things, for without co-operation no progress can be made, not even in science. *(Applause.)*

THE PRESIDING OFFICER: Superintendent Pittinger wishes to get away on an early train and the next speaker has given way to him. Mr. Pittinger, who will now address you, is Superintendent of the Frankfort Public Schools.

MR. PITTINGER: Mr. Chairman, ladies and gentlemen—When I was a boy I attended a country church, and at the annual meeting the ministers used to line up on the platform and one would preach for an hour and the others would coincide with what he had said for a half an hour each. I have in mind this morning that I would coincide with what the speaker who preceded me has said.

There is just one thought in connection with what Dr. Book said which I want to emphasize at this time, and that is that we need help. I wonder if we remember how little many of our teachers know about some of these things which we are talking about here, how poorly they are prepared to carry on this work, and how little they know about it.

Now just a few years ago, a year or two ago, some of you perhaps know how we worried over this question of the median and differentiation, and some of those things, for five or six weeks, and we got a little idea concerning them. Now, our teachers do not know how to carry on these simple scientific experiments, and because of lack of science and lack of ability and knowledge on our part, we cannot take the lead and do many of these things as effectively as we ought to do them. We might say, 'Well, send your teachers to college.' You know why they do not go to college. They cannot go; and if they could we could not spare them, not very many of them at a time. Many of our teachers are taking care of widowed mothers and broken-down fathers, and crippled sisters; and they are helping their younger brothers and sisters to go to college, in order that they may have a better chance than they have had. You know that is true in your corps. At one time, three-fourths of the teachers in my corps had home responsibilities and problems which they could not possibly leave. What we need is expert help from the University, not in the way of a questionnaire from some professor, or from some student who is working on his master's thesis; but we need the man himself to come right among us and teach our teachers who are hungry to know, who want to know and who want direction, sympathetic leadership, and help.

Now, if it is worth while for the State to furnish teachers to teach the young men and women here on the campus, some of them who don't have very definite aims, some of them who are not intensely in earnest, is it not more worth while that the State should furnish competent men and women to come right among our teachers who are hungry, who do want to know, and who have a purpose and who have a great work, and help them to do this work? I believe, ladies and gentlemen, that that is the thing that we need. We need to have our teachers taught and ourselves taught, and this work directed, and I think it is very much more important, as this work is being done, that it should be done in a way that our teachers be not discouraged. They are a little discouraged with the problem. It seems so big, and so heavy to them, and they should be helped in a way that will not discourage them, or eliminate them. Sometimes in our enthusiasm we criticize the teachers. We criticize those who are down in the trenches doing the hard work. Well, if we were to lose them we could not do as well. They are the very best we can find, and many of them, I think, are doing better than we could do ourselves in the work which they are doing.

I believe, ladies and gentlemen, the thing which we need is the scientific help from the University, the kind of help we will get if they will come right out and work with us. Come over into Macedonia and help us. *(Applause.)*

THE PRESIDING OFFICER: Superintendent L. J. Montgomery, of the South Bend Public Schools, could not possibly be here on account of illness. He has sent his paper and we have arranged for Superintendent Muner to read it.

[Superintendent Nuner read Mr. Montgomery's communication, in part, as follows:]

I wish to make only two points, one in regard to educational surveys, which I think should be undertaken by Universities; and the other to emphasize unit courses for superintendents, such as the one you are conducting this week. I should have discussed these matters somewhat as follows:

Such a short time in which to suggest to a great state institution like our State University what it can do for the public schools in various sections of the State. Unfamiliar as I am with what state universities throughout the country may be doing, and as unfamiliar as I am with what even our own State University is doing for our own State, if I suggest what is already in progress, may I apologize now to such members of the University faculty as may be here. I shall only attempt to call your attention to two matters in which we need help, and if the University can render such aid I believe the State as a whole would be benefited.

First, we need expert advice, such advice as can be offered only by those who have made a thorough preparation in some one particular line. An age of specialists, it is called, and school officials should be able to call to their aid, even for temporary purposes, experts the same as do the managers of all business enterprises. No school unit should be considered too small or too far removed to receive benefit from the best judgment that can be formed.

In spite of the fact that every local school system has supervisors who are especially prepared in their particular line, and in spite of the fact that ward principals, high school principals, and also officials in the superintendent's office have been first well qualified and have then passed through several years of varying experience; yet perhaps there comes a time when no one in the entire force seems able to say with certainty what errors exist and what corrections should be made. Often, also, no one within the system is prepared to see that times have changed, that new methods are needed, and that vigorous measures must be taken to make the schools meet the needs of the locality. We often find the community more alive to these needs than the school people themselves. At such a time it seems to me that the communities within the State should be able to get and should feel perfectly free to call upon some department of the great State University for advice and expert assistance.

Recently at the superintendent's section at Richmond it was very evident that the leaders in modern educational thought were members of faculties from various universities. A large part of the program, upon the most vital subjects, at least, was prepared by members of the various colleges of education throughout the country. Such leaders as Strayer of Columbia, Hanus of Harvard, Judd of Chicago, Jessup of Iowa, and various others were at all times in evidence and were called upon to render judgment upon the most vital matters under discussion. Evidently, it is recognized by the school superintendents throughout the country that these men are making a study of the questions which affect city systems and it is also obvious that such superintendents are willing to accept the judgment of these men as of greater value than their own. It must be that these men have the time, the inclination, and the ability to study these questions to a logical end and derive therefrom results which have greatly changed modern educational thought.

Such being the case, why should not school people in our State feel that we have the right to call upon our State University to send to us some properly qualified representatives of its own to make investigations, draw conclusions, and suggest remedies and plans for the future? In other words, why should not our University be able at any time to send into the farthest point of our State, if necessary, experts to make an educational survey upon any phase of school work for which they might be called. I believe such a department should be established at the earliest possible date. I do not wish anyone to infer from this that in my opinion our State University has not at the present time members on its faculty well qualified to do such work, but, if such work is being done, or if such a department exists in our State University or in any other state university, I have failed to hear of it.

It seems to me that this is one of the best ways in which the University could come in contact with the entire school problem in the State. School surveys are no longer in their experimental stages. A few years ago, in fact a very few years ago, such surveys were unknown, but today we have merely to read any educational magazine to find comments, and in most cases favorable comments, upon such surveys which are being undertaken in different parts of the country, and in most cases such surveys are not being made by members of a university faculty of the state in which the survey is being taken, but in nearly all cases authorities are being called in from without, whether necessarily or not, such seems to be the case.

We have two well-known organizations in the United States, connected in no way with any educational institution, one of whose main purposes is to conduct such school investigations. I refer, of course, to the Russell Sage Foundation, and the Bureau of Municipal Research of New York. These two organizations have conducted many such investigations within the last few years, and at the present time seem the most reliable and almost only available source upon which school people may call. Organizations conducted as they are must pay expenses. The men are designated as experts, but I am fearful that many in the employ of these two organizations may be far from experts.

Next Monday the Bureau of Municipal Research starts a survey in our own city. We have had more or less trouble to get experts who have apparently at least had the necessary experience to make them competent. They charge $40.00 per day. Let us have an appropriation from the State for this purpose so that the local expense will be only nominal and not almost prohibitive.

In the second place, I would like to suggest a continuation of such meetings as you are now holding. Bringing as you have to this State Prof. Thorndike, than whom there is no greater authority on standards, seems to me has been placing before the school people of the State the latest and one of the most progressive ideas in education. You will all return to your local plants inspired to do more thorough and efficient testing.

Standards for the basis of measurement in school work must be employed and when based upon sufficient data must be accepted as better means of judgment than the opinion of the individual. Let us have more of these short unit courses; let us have one on supervision when our own University can be assisted by such men as Coffman of Illinois, Bobbitt of Chicago, and Elliott of Wisconsin. Let us have one when other standards of measurement than have been discussed this time can be presented by such men as Strayer, Witmer and Judd. Let us have one on vocational education with help from James of Minnesota, and Snedden of Massachusetts. In these ways I believe the University can be of great help to the entire school system of the State. *(Applause.)*

THE PRESIDING OFFICER: Superintendent E. H. Drake, of the Elkhart Public Schools, is the next speaker.

MR. E. H. DRAKE: Mr. Chairman, ladies and gentlemen—It was not by preconceived arrangement that those who were on for the discussion this morning should follow the example of the preachers referred to by Superintendent Pittinger, but my thoughts are very much in line with what has been given; and in order to say what I have to say as briefly as possible I have reduced my remarks to writing.

The University has experts in elementary, secondary and vocational education, and in school administration, in connection with the School of Education. The experts are constantly studying and investigating various phases of school work and administration. Local schools do not always have those who have time or opportunity to do these things for themselves. Since this is the case, the University might carry its work to the locality and render a valuable service.

The best results from investigation, experiment, educational theory and practice can be brought to the very feet of the teachers of any department in the local community, thus giving the opportunity to all alike to secure the benefits of a knowledge of current educational activities and influences now enjoyed by the more fortunate few who can go to the first-hand sources for it. Moreover, the visit and lecture of the educational expert will reinforce whatever in kindred line a local superintendent or principal may already have brought into his school system. Not only the pedagogical expert from the University, but professors in various departments, by visits and lectures in local communities, can give much of value.

The expert in the elementary school line can help the local authorities test the actual attainments and performances of the children by means of standards of measurements, tests, etc.; also help them study such problems as retardation and elimination, their causes and remedies; the character of teaching and supervision, and how to improve the quality and efficiency of each; the kind and nature of special supervision and means of improvement; the problems of the curriculum—and these are many today—for example, the kind and quantity of subject matter and the standards governing its selection, the placing of relative emphasis, adjusting to the varying degrees of ability of the children, the balancing of vocational and non-vocational work, and so on.

The secondary expert can do much of the same nature for the high school and help make the adjustment there to meet the varying needs. He can help secure the proper balance of the courses in the necessary readjustment to present conditions by which those going to higher institutions of various kinds, those preparing for vocations without higher preparation, and those seeking culture alone can best supply their needs. He can also offer many suggestions as to latest ideas relative to different subjects of study, etc.

The vocational expert could come into the field and be of great assistance to superintendent and school board in connection with a representative from the State Board in making the preliminary investigation necessary to find whether there is a real pronounced need for vocational education and for what industries or vocations the proposed school should prepare, and he can help get the work under way.

The expert in school administration could reinforce the work of these other specialists, and offer to school board and superintendent much by way of suggestion as to business administration, physical equipment and maintenance, record, report, inspection, improvement in compulsory attendance, and how to secure a greater degree of community co-operation.

What I am trying to say I can give in brief by stating that the University can come to the local community and give valuable help through inspection, lectures, and suggestions by its professors; also in making a proper school survey, and in helping bring about the improvements that such a survey would indicate as advisable. *(Applause.)*

THE PRESIDING OFFICER: Mr. J. T. Giles, of the Richmond Public Schools, is the next speaker.

MR. J. T. GILES: Mr. Chairman, ladies and gentlemen—Of all the things that the University might do I have thought of suggesting three things. But all of these things have already been emphasized in the talks.

In the first place I wish to commend the University for giving us this opportunity, and may I suggest, Mr. Chairman, that this body be given an opportunity somehow to express its hearty appreciation of what has been done here. I am sure we have all been helped, and I am sure the success of this conference warrants a repetition of it.

Now, the second thing that I had in mind has been mentioned, I think, by every speaker; that is, that the University should send to us experts, men who can help us in doing the thing that we would like to do.

May I add a bit of experience which will show you, by way of illustration, what I mean. Two or three weeks ago Dr. Strayer, on his way West, stopped off in Richmond for three or four hours. I had already provided a set of fifth and sixth grade compositions and a set of seventh and eighth grade compositions, and copies of the Hillegas scale. The teachers were called together at three o'clock, and Dr. Strayer talked fifteen minutes, I suspect; then we all went to work with the Hillegas scale, grading those compositions. Dr. Strayer knew how to do it—we didn't—so that there was very great economy of time. In an hour and a half we had graded the compositions, and we had tabulated the results on the blackboard. Those teachers then knew how to do it. They knew also from the results of that tabulation that almost twenty per cent of the papers were graded alike There were four grades. Each paper was graded by four teachers, and in nearly twenty per cent of those papers the four grades were alike; in fifty per cent there was only a difference of one. That is simply an illustration of what can be done if we can have some of these experts here come out and help us to do some of these things that we want to do. It is going to be of very great advantage to us.

Now, the third suggestion that I have is one which perhaps has not been emphasized so much, and that is that the University, this Department of Education here, should be a clearing house for the distribution of information in regard to the things that are being done in the State. Let me illustrate that by two or three things.

In the first place, in order to do that I would like to suggest a closer co-operation between the University Department of Education here and the State Department and the schools. Now, there are the three factors. We have the need. We know what we want. We have the problems. The State Department has the authority. Now, I understand that the reason that the State Department does not have a department of statistical investigation is probably because they haven't the funds to do that, but they have the authority to get the facts and the University has the experts. Now, there are the three factors. If we can get those three factors to co-operating we will get what we want, what we need out in the State.

Now, let me illustrate. I would like to know what the other superintendents of the State are paying their janitors. That is a small thing, but it is a very important thing, and I would like to know about it. The only way I can know is to send out a questionaire, and you know how abominable they are.

As to this matter of arithmetic, I have a little blackboard test that I am working out in my school, supplementary to the Courtis test. It is not refined like that, but to help the poor schools I would like to have help on that, to get it standardized a little bit.

Now, one other thing. Our high school faculty has been working this year on preparatory vocational guidance. If we can get what you are doing on that it would be of advantage to us. We are all interested in it. If we can get the means of comparison through the School of Education, so as to know what they are doing, and through them what you are doing, then, don't you see, we are going to help each other very much more than we can when every fellow works by himself? I thank you. *(Applause.)*

The Presiding Officer: The next speaker is Professor H. G. Childs, of the University.

Professor Childs: Mr. Chairman, and ladies and gentlemen—I am in agreement with nearly everything that has been said. Superintendent Giles has just taken away the very point I intended to suggest; that is, that the University, through the School of Education, should be a clearing house for the educational problems of the State. That is what we hope to make it; but in order to do that, we must have your co-operation. For instance, in a number of schools throughout the State, I think in every place where I have gone, I have found that the superintendents and some of the principals and teachers are working over the same problem. They have learned something that is really valuable, something that nearly every other superintendent in the State would like to know about, and yet there is no means of spreading that knowledge. You are keeping your light under a bushel, so to speak. We would like to have your co-operation to take up all of these problems, to have a group of twenty or thirty superintendents working on one problem; twenty or thirty working on another problem, and a number on still another problem; making the University, in a way, a clearing house, so that we can use the data from all these schools to establish norms.

We are perfectly willing, I can assure you, to give advice, suggestions, and assistance at any time that we are called upon, so far as we are able to give it. That is one idea, I think, that we have in mind quite definitely here at the University.

The second thing, it seems to me, that the University can do is to conduct research work. Dr. Haggerty has given you an illustration this morning of what his department is doing in the way of research in educational psychology, and the various problems connected therewith. My own field of work is more especially in administration. Of course, these fields all overlap, and there are a great variety of problems, administrative, psychological, and otherwise, in regard to which we desire to carry on research work. That research work can be, in many ways, most effective with your co-operation. That is, we want your schools as laboratories. The Bloomington schools are at our disposal, very largely through the kindness of Superintendent Smith. He is interested in working out these problems, and gives us a free hand to go into the schools and carry out any type of experimental work we wish to do. Among some of the problems we are considering this year, have started, and are getting under way, of a supervisory or administrative nature, are the following:

1. A course of study in physics which, I think, will have value for all the high school teachers of physics throughout the State.

2. Values in the teaching and supervision of drawing.

Now we are just starting that problem, just making a first study. I have, over there, displayed some results, which I shall not have time to explain. We have taken the recent Thorndike scale of drawing, which I have supplemented from his first supplementary list of drawings, to some extent, and on the same basis as the original scale was made, by getting a certain number of judges to rate these, and then, by making comparsions of different qualities of drawings scored on the Thorndike scale, secured a greater variety of samples to use on the scale. We have charted the results in the Bloomington schools, and they are on display.

3. A study to determine the adaptability of the course of study to the community needs in different schools of the State.

4. A study of what becomes of the high school graduate.

In the movement for vocational education we want to know what sort of effort leads to certain results, and we are trying to find out. We have had some studies concerning the elimination of students in the high school, why they are eliminated, and why they are retarded. We want to find out what becomes of the graduate, what degree of success he has, what his course of study was, what its psychological value was to him, and all that. We want to follow him through a period of years.

5. Nature work and the teaching of biology in the high schools of Indiana.

6. Unit costs of teaching high school subjects.

7. Causes promoting the success or failure of high school students.

8. The financial value to beginning high school teachers without experience, of courses in education.

We do not know whether you superintendents pay any more for teachers who have taken our courses than you do for teachers who never saw our Department. We want to find out whether you do or not, as a basis for readjusting our work in giving such courses if you do not, so that it will seem to you to be worth while, so that you will pay more for teachers who have had the benefit of such work. I am referring to this simply to indicate some types of study we are pursuing.

The other point I wish to make is one frequently emphasized by speakers on this platform, and relates to school surveys. I have been here only a brief time, and have not been called upon to assist in any surveys. I agree with Superintendent Smith, however, in his point of view in regard to school surveys, for the most part. I believe that the school system is going to get more value out of its survey if the major part of that survey is in the hands of the local superintendent, principals, and capable teachers who are willing to undertake the work. I believe it is one of the most effective means of making teachers grow and develop. You can give them a course in school administration by working them through a school survey; but it should not be a sort of spasmodic thing, for two weeks, and then over with; but it should be a continuous performance. You can take up this year some important phase of the work; you can divide up the work of your school system, the things you wish surveyed, and devote this year to one phase or aspect of that work, and next year to another phase or aspect, and the next year to another, and the next year to another; and before you get around, in three or four years, you will need to begin the survey all over again. Keep it up as a continuous performance. The University professors, I assure you, wish to contribute what they can to assist in such work, to aid you in organizing and directing it.

In conclusion, I wish to announce that during the first six weeks of the 1914 Summer term, our courses in Administration will center about two important problems: (1) School Surveys and (2) The scientific measurement of results. (*Applause*).

THE PRESIDING OFFICER: It has been suggested that before Mr. Black closes the special discussion, that we hear, for two minutes, Professor I. S. Kelley, the only official consulting psychologist in the State, representing Culver.

Professor Kelley: Mr. Chairman, ladies and gentlemen—Two minutes is not a very long time, but I will make short what I have to say.

Superintendent Giles mentioned as one of the things in which schools need co-operation, the matter of vocational guidance. Now, that term is rather a narrow term. We ought to extend the term to guidance. What we need is not simply to take the boy after he has left high school, and say what he should enter as a profession, or vocation, but we need to help him in his high school course, in order to prepare him for that vocation which he is going to enter. It surely is not absurd to think of preparing, for three of four years at least before you finish your school course, to spend that time in specializing more or less upon your work.

Another fact, and it makes this possible, is the fact that ability to pursue a task is largely a matter of heredity. That is to say, that we can tap a boy four or five years, or even more, before he has left high school, and find out what his capacities for learning are. We can tap him at that time, and so adjust his course that for the next three or four years he can be preparing specifically to meet those needs.

As to how that works out in the high school, I would say that my work is examining the boys who come to school, finding out what course they can carry, what they are almost certain to fail in, and to recommend changes in their course with a prospective view to some vocation. The importance of this is apparent to probably all of you, but it is not apparent to the extent, or at least it is not apparent to those who employ the teachers in school to the extent that they are ready to pay for it. Now, if there is anything that I could say to show the necessity for educational guidance in the high school as a means of preparing a boy for some vocation when he gets out, I would like to say it, and I would like to say it so strongly that those who employ teachers would be willing to pay for it. That is the test of it. I think it is going to come. In fact, I am sure that the moment vocational guidance begins to have a commanding position in this State and throughout the country, it will go down into the high school, and guidance will start at least in the high school, and possibly as far down as in the grammar grades. *(Applause.)*

The Presiding Officer: Professor Black, of Indiana University, will now close the discussion.

Professor Black: Mr. Chairman, ladies and gentlemen—The other speakers have left little for me to say, except that if the members of the faculty of the University were all educational experts, and if we were to close our doors and all go out into the field to work with you, we should not be able to accomplish all you have asked for this morning. But I like the spirit in which you ask: it is the spirit in which we all should work.

I will state almost in a sentence what we hope to do as a School of Education, in so far as the size of our faculty and the amount of money that is at our disposal will permit. We must not forget that the first thing we must do for the young men and young women here in the University who are going out into the field as teachers is to give them a good, sound, academic training, which must include a genuine student attitude and open-mindedness, so that they shall be students so long as they are engaged in the work of teaching.

In the School of Education we take up with our students the fundamental principles of instruction, organization, and management in general, and school administration, and the history of education as a background for constructive work. We do not expect to give the student more than a sufficient amount of undergraduate work to secure to him a fair grasp of the problem of teaching. If we can confine the undergraduate course to things that are fundamental and concrete, and give, say, from twenty to thirty term-hours in Education, we should greatly prefer that students use the rest of their undergraduate time in a thorough academic training. For this reason, the A. B. degree is not offered in Education.

Then with our graduate students, with the basis they get in undergraduate work, and with the teaching experience most of them will have had, we shall make a genuine graduate study of the problems of education in the fields of elementary education, secondary education, school administration, educational psychology, and the history and philosophy of education.

Of course, we shall give much attention to research and experiment; and from the reports made at this meeting by Superintendent Smith, Mr. Ramsey, and Miss Kerr, you will see that excellent opportunity for this kind of work is afforded us here in the Bloomington schools.

Now, in this same line, we hope to do much out in the field in the way of co-operative study with teachers and school officials. For the purpose of discovering conditions and vital problems, we wish to co-operate with different schools in the State in making local surveys, either whole or partial; we wish to make co-operative studies in the field of the problems of instruction, the course of study, organization, the exceptional child, administration, and the like.

Conferences, such as the present one, we wish to keep up. The first one was that inaugurated by Dean Rawles, the Director of the Extension Department, the Tax Conference, which you know has set a pace that it is hard to follow; and then following that, this one that Professor Haggerty has managed so well, which gives us a pace that it will be difficult for us in Education to follow; but I wish to announce one other that I believe will not fall below. That is the conference-lecture course that we are to hold during the first six weeks of the coming Summer term on vocational education and vocational guidance.

The first week (week of June 29th) we have Director Meyer Bloomfield, of the Vocational Bureau of Boston, who will lecture at eleven o'clock in the morning, and conduct a conference in the afternoon at four. The second week of the conference Professor John Dewey of Columbia University, will lecture in the morning and conduct a conference at four o'clock in the afternoon. The third week we have Professor John M. Gillette, of the University of North Dakota, who comes to us with the sociologist's point of view, and we are expecting an excellent week with him. The next two weeks we shall use in getting well acquainted with the literature on vocational education, and to get before us the points of view of the educator, the manufacturer, union labor, the psychologist, and the sociologist. And the last week Professor Book will give a lecture each forenoon and hold a conference each afternoon on the problems of vocational education here in Indiana. Through this six weeks we shall hold a joint seminar on vocational guidance.

I wish to mention the work of our departments of Home Economics and Vocational Education. I will say that almost a third of the young ladies in the University have done work in the Department of Home Economics this year. We are prepared to go, at least to a limited number of localities, and advise in the matter of putting in outfits, in the organization of the work among teachers, and the like. By the beginning of next year we hope to be in good condition to send men out into the field in vocational lines. And all this we expect to do at a minimum of expense to localities. You may call on us for whatever you may think we might be able to do, and I assure you that if it is possible for us to do so we will meet your wishes. *(Applause.)*

THE PRESIDING OFFICER: By special arrangement, the program is to be closed at 12:15 p. m., instead of 12:00 o'clock. Now we have five minutes, if anyone has any question to ask.

RESOLUTION OF APPRECIATION

MR. MOTT: Mr. Chairman, I have just prepared a resolution which I wish to read. May I read it?

THE PRESIDING OFFICER: You may read it.

MR. MOTT: In view of the splendid success and inspiration of this meeting I was inspired to write this resolution:

'We, the representatives of the educational forces of Indiana, in view of the splendid work of this meeting, hereby express our appreciation of the efforts being made by Indiana University to uplift, unify, and standardize the work and school practice and school administration in Indiana; and we, hereby, heartily urge that an Educational State Conference, similar to this, be called by the University each year.'

I move the adoption of this resolution.

[The motion was seconded.]

THE PRESIDING OFFICER: You have all heard the motion as made and seconded. As many as are in favor of the motion will please say 'aye.' Those opposed, 'no.' The 'ayes' seem to have it, the 'ayes' have it, and the motion is carried.

THE PRESIDING OFFICER: Next on the program is an address by Dr. Thorndike, 'Units and Scales for Measuring Educational Products.' Dr. Thorndike has a full hour, and after Dr. Thorndike Professor Haggerty has an announcement of one minute, and then that famous lunch that has been announced here is ready to take place.

UNITS AND SCALES FOR MEASURING EDUCATIONAL PRODUCTS

DR. THORNDIKE: Mr. Chairman, and fellow students of educational measurements—I think it will expedite matters a little bit if four of you gentlemen will be so good as to give out generally the sheets, one, two, and three, which are a sort of 'omitted-word test,' as I may have occasion to refer to that. There are a few copies here of a certain history test. I did not bring enough probably, but I shall from time to time perhaps refer to some of these, using them as sort of texts.

We are accustomed to think of the work of education under four headings. Its aims; what we want to do. Its material; the boys and girls that we have to work with. Its means and method; the course of study, the material plant, the laboratory facilities, the teachers, their personalities, their methods and their devices; and, in the fourth place, its results.

When, about eighteen or nineteen years ago, I began the serious study of education, I cannot remember having been taught anything whatever about the results of education. I heard many useful things about its aims, and about the nature of human beings in whom education does its work, and about the means and methods and devices of class room instruction; but I cannot in the least remember any definite statement about the product produced. It was as if we had an acccount book for education with only the debit side filled in. Indeed, if you read the reports, say of the United States Bureau of Education, or of any State Superintendent, you will find what was done, what was spent; that so many children spent so many hours of their time, or so many teachers hired at such cost spent so much of their time and energy and anxiety and blood and tears, etc.; that such and such buildings were used and were built; but, as to what came of it, what the output was, what the manufactured product consisted in, we had only the barest statement that so many were graduated with this degree, and so many passed through high school in such a course, and so many reached such and such a grade of the common school. That practically was as far as we got with statements of the results. And probably the main reason why we lagged behind in our knowledge of results, in comparison with our knowledge of aims, means, and methods—the main reason why the side of the account telling what we have made in our factory is rather empty, while the side of our account telling what we have spent and put into the business is so full—has been the lack of units and scales whereby to measure these products.

We could measure the dollars and salaries because we had the scale of money price. We could measure the amount of time given by teachers because we had what is perhaps the best scale that the world knows, the scale of time in seconds, minutes, hours, etc.

Now, there is no topic perhaps to which the human mind tends less by original nature to attend than that of units and scales for measurement. The most abstract thing in the world is a scale for length, or a scale for weight, or a scale for time, or units of temperature. We care about hot weather—that 'gets us,'—as the boys say; but who cares about the thermometer? What person in this room has a tremendous vivid interest in the calorimeter, and the like? It is only the rare person with a pertinacious zeal to get at facts and control them, the person who loves the game of ideas, that really can take a very lively interest in such an abstract thing as just the means of measuring something else.

Yet most of you will agree with me that little as we do, by our original make-up, care about these things, they are among the most important things in the end to the success of human living of any thing we know. The skill and courage of the most daring seamen that ever traveled the seas, millions of them put together, would not do as much for the practice of navigation as the mariner's compass, which is simply a scale for telling direction. The most patient labors of people for years upon years in piling up fuel, cutting down trees and piling it up, has not done as much in economizing or saving the effort of men as the discovery of the thermometer. If everybody in this room should live a million years and should spend all that time in rolling the stones of Sisyphus up-hill, pushing our muscles to the utmost extent to lift all we could possibly lift, the load that we should lift in this million years for the world, would not compare in achievement with the saving in lifting that has been made for the world, past, present, and future, by the simple existence of the scale for measuring weight.

We may hope that in human affairs, as we come to measure not only the time the teacher spends but also the energy, the strain and effort and intellectual capacity which she devotes; as we come to measure not only the weight of the children year by year but also their growth in ability to write English, in ability to express themselves orally, in ability to make wise observations, and so on—we may hope that in these ways some such profit may come from getting scales of mental nature as has come from getting these scales of physical nature. They have only recently begun to be even looked for.

In 1897, or about seventeen years ago, J. M. Rice went about this country making certain tests of spelling. The attitude towards him perhaps some of you observed, but few of you probably took enough interest in it at the time to remember or realize it now. The general attitude, I think, was that here was an eccentric person who was trying to perform the impossible task of measuring things in human nature. People didn't criticise, as they might very well have done, the particular method that he took. They did not blame him, as they might very well have done, for certain inadequacies in his procedure. The common objection was not to the way in which he did this, but to the proposal itself, the very scheme, that a person should dare to attempt to measure things in human nature.

Dr. Rice deserves great credit, in my mind, for having been the first person in any systematic extensive way, to hunt for rods and scales to apply to the human mind, to intellectual achievement. Dr. Rice was approximately ten years ahead of the educational procession.

In 1908, ten years later, under the guidance of the staff of Teachers' College, Mr. Stone did a similar study, by better methods, in the case of arithmetic, testing some twenty-three school systems comparatively with respect to the achievement of sixth-grade pupils in arithmetic, using tests of the fundamental operations, and the like. People did not rebuke Mr. Stone for presumptiousness in attempting to measure things in education, but in general they rather neglected his work.

I cannot recommend Mr. Stone's paper as an exciting thing to read. It is not the kind of a thing one takes up on a hot summer day to pass the time away with, but there did happen to be one person in the country to whom it was an exciting exposition, and whom it did arouse to action. The stimulus of Mr. Rice's work was enough to set Mr. Courtis going, and he has been going ever since, and I judge at an accelerated rate. In 1909 it was that Courtis's first written work appeared, and since then the work of measurements and scaling in arithmetic has been closely associated with his name.

Now up to about four years ago, if we got any sort of a measurement which would give us a result that was sound, that was objective, that we could depend upon, most of us were content; but at about this time some of us began to hope that we might do more than get a measurement that was sound, that was more than mere opinion, that was not somebody's 'say so' merely, not a teacher's mere mark on a paper; and we asked the question, 'Would it be possible in the case of education to get the kind of measurement that we have in physical science; to get something like the measurement of length or weight?' We can tell of a boy's stature in a perfectly definable way, so that everybody in the world will know what we mean, how tall he is, how much he has grown, whether he is twice as tall as another boy, and the like. We can tell the amount of weight that a person can lift. We can tell with perfect clearness just exactly how much he can lift. If I say that so and so can lift a hundred and twenty-eight and a half pounds, men know just what I mean in every civilized country in the world. If I say that a year from now we hope to have him able to lift two hundred and fifty-seven pounds you know just what I mean. If I say that he will then, if we do educate him up to that, be able to lift twice as much as he now can, you all know what I mean.

Can we make statements like that concerning knowledge of arithmetic, ability to translate German, or the quality of an English paragraph as it is written, and the like? Can we define a person's achievement, the educational product that he turns out in writing, penmanship, and the like, as we define the weight a man can lift, so that anybody can understand and know just what we mean, so that change in it can be measured definitely and so that we can apply this 'times' judgment, so that when we say 'four' and 'two,' four will really mean twice two, half of eight, and so on?

The first effort of this sort was a modest one made by myself in the shape of this scale for handwriting. (The speaker here showed a copy of The Thorndike Handwriting Scale.) You cannot see this, and I did not bring enough to give them out to each of you. Many of you know this scale. Let us think, in terms of handwriting, of the logical essentials of an ideal physical scale. When we say length and weight and time are ideal scales, they are ideal for two main reasons; the first one is that anything that is equal to 'one' on the scale, equals anything else that is called 'one;' that from seven to eight is the same as from eight to nine, nine to ten, ten to eleven, ninety-nine to one hundred, one hundred and three to one hundred and four, and so on. No scale will be finally satisfactory which does not have equality of units. Length and weight do. That is, one inch anywhere on the scale is the same as any other inch. One pound is the same as another pound. From fifteen to sixteen is the same as from twenty-five to twenty-six. The other quality is the existence of real, genuine zero point. What I mean by a real, genuine zero point is that the zero of the scale should mean 'just barely not any' of the thing in question. When we say that such a thing is of zero length, or has zero weight, we know what we mean. We know that it is just barely not one-millionth of a millimeter. We know it was just barely not one-millionth of a gram. We know that nothing means in this case no weight. We know what zero in the case of length means.

Now, in handwriting, can we get something that we can call properly 'zero in handwriting?' I myself created the absolute zero in handwriting! (The speaker here wrote a scrawl on the blackboard.) I took something about like that, and deliberately assumed it was zero. It was near zero, since nobody could read any part of it. It had no beauty, no smoothness, and had nothing of that rather imaginary quality which is called character in hand writing. If anyone thinks he observes any legibility, smoothness or character in this specimen, then I may have something to retract.

I have since acquired an actual zero, produced by a human being. I have a signature from a letter which cannot be read *in toto,* and of which no letter can be read, by anyone out of hundreds of people who have tried; and which has no beauty, I assure you; and which can express nothing of any qualitative value in penmanship; and I shall now replace our old zero by that.

Here (drawing at the blackboard) is a scale-line for quality of handwriting, and we have defined zero as a suppositional handwriting such that, though recognizable as handwriting, it has no legibility, no beauty, no value as penmanship. Now we want to get things scaled off along this line, say into two, four, six, eight, ten, twelve and fourteen; or into four, five, six, seven, eight, nine, ten, eleven, etc., the requirement being that this scale should throughout be for the same kind of thing. We do not want to jump from length to temperature, or from weight to time. We want it to be a scale for some one thing—quality in handwriting. We want to get these spaces on it definite, and for convenience we want to have them equal.

Now, there is a certain theory, with which I will not very much bother you, but according to which we can in an intelligible sense say that differences in merit between samples in handwriting are equal. The sense is this: Suppose we had in this room one thousand of the best judges of handwriting in the world; suppose that a certain sample—this sample which is here marked ten—was judged by these thousand people in comparison with the sample I have marked nine; suppose it was the case that seven hundred and fifty out of the thousand competent judges said 'Ten is better than nine;' suppose that two hundred and fifty said 'No! Nine is better than ten;' suppose, again, that these judges compared number eleven with number ten, and seven hundred and fifty said 'Eleven is better than ten,' while two hundred and fifty said 'No; Ten is better than eleven.' Suppose we had the thousand compare number twelve with number eleven; suppose seven hundred and fifty said, 'Twelve is better than eleven,' but two hundred and fifty again said 'No; Eleven is better than twelve.' Then we could say that the difference between nine and ten is equal to the difference between ten and eleven, which is equal to the difference between eleven and twelve, in the sense that the three differences are equally often noticed by competent judges. That is one of the principles by which we are building up these educational scales. We get the best zero we can by all the means in our power, using the evidence of as many judges as we can, and then we get equality of the intervals on the basis that those two things in intellect or in educational product are equal which are equally often noticed by competent judges.

There is another means, and in general a rather better way, of getting at our scales. This may be illustrated in the case of a scale for the difficulty of spelling words.

First, is that word fair? Is there such a thing as a varying amount of some one thing, spelling-difficulty? All of us in this room probably feel that in a certain real sense the word 'manoeuver' is harder to spell than the word 'only.' or the word 'is.' or the word 'boy.' Is there anybody in this room that does not so feel? I think we will all probably agree that a word like 'manoeuver' in a real sense is a harder word to learn to spell than 'is,' or 'boy,' or 'only.' Now, we mean by difficulty of words just what the average of good judges like ourselves mean. We all feel, in the extreme cases, that certain words are more difficult to spell than others. The question is to fill in the gaps. We would put words like 'raisin,' 'manoeuver,' or 'separate' off up here somewhere (the speaker here pointed to one end of the scale on the blackboard), and put 'boy,' or 'is,' or 'only' down here somewhere (pointing to the other extreme). The task then is to fill in between with convenient samples, with known spaces of difference in difficulty between each two, and also to define our zero of spelling difficulty. I do not absolutely remember what Dr. Buckingham and I finally decided on as zero difficulty in spelling, but I think it was a little less than that of the word 'go.' For a pupil just not to be able to spell a word like 'go,' or 'so,' or 'at,' or 'cat' places him down fairly near zero ability in spelling. So we say that about here on the scale (pointing to the lowest extreme of the scale drawn on the blackboard) would be words like 'go' and 'at.' Dr. Buckingham then gave to some thousands of children a great many words to spell. He picked out a set of words where the difficulty is not informational primarily, as it is with, say, 'Popocatepetl.' That is not a hard word to spell, if you know what it is, whereas, with a word like 'raisin,' you may know perfectly well what it *is*, but have difficulty in spelling it. He started with two hundred and fifty words of a wide range of difficulty, in each of which the difficulty was a real spelling difficulty and not an informational one, and tested as many children as could be obtained. The argument used in getting these equal spaces, or equal differences in difficulty, was not the same as before, but was substantially the following: Suppose that our test is for pupils of the fourth grade. In a certain, real intelligible sense we may say that, if the percentage of pupils that spell the word 'only' is a certain amount (call it x), and if the percentage of pupils that spell the word 'smoke' is a certain smaller amount of the fourth-grade pupils (call it x-a), and if the percentage that spell 'another' correctly is still smaller (call it x—(a+b)—that the words follow the order of difficulty, 'only,' 'smoke.' 'another.'

We scale these words by the percentages of errors, the argument being that a word is harder which fewer children spell correctly. The next question is, 'How much harder?' Here we will have a very intricate problem which I will not bother you with. It is possible, however, to assume that the greater difficulty of a word does mean being less often spelled correctly by pupils of the same grade. It is then possible to say that one word is as much harder than another as that other is harder than a third. For example, the words 'only,' 'smoke,' 'another,' 'pretty,' 'answer,' 'tailor,' 'circus,' 'telephone,' 'saucy,' 'beginning,' etc., do progress up by approximately equal steps. We can, for example, in this real and intelligible sense, say that to spell 'beginning' correctly is about twice as hard and difficult as to spell 'only' correctly, in much the same sense that two feet is twice as long as one foot, or two pounds is twice as much as one pound; namely, in the sense that one is twice as far from the zero of spelling difficulty as the other.

These are the two main methods of deriving units and scales. One is by utilizing the supposition that the percentage of judges noticing differences is significant, and that if equal percentages of competent judges notice two differences, those two differences are about equal. The other is to utilize the actual achievements of the children.

Once we get used to such scales as these it does not become longer imperative to have this equality of intervals. If we had a yard-stick which was measured off like this (the speaker here illustrated a scale with irregular intervals), this point being marked 'three and a half inches,' another point 'eleven inches and a quarter,' another point 'twelve inches and a quarter,' another point 'fourteen inches,' and another at 'sixteen and seven-eighths,' we could still measure with it perfectly well. It would not be quite so convenient, but still we could use it. If you will look for a moment at the scale for drawing, which some of you have, you will see this scale differs from those I have described. The intervals are not equal. Since in this scale for drawings the spaces of the scale do run from zero, I will put zero on the blackboard for you because that is amusing; we take that as of zero merit, as the drawing of a child five or six years old, it being the drawing of a man, because nobody could ever find out it was the drawing of a man, and it does not possess any beauty, either as a representation of nature or as a design. The first point shown on the scale is zero. The next point is two and four-tenths; the next, three and nine-tenths; the next, five and seven-tenths; the next, six and five-tenths; and so on. The obvious criticism is 'Why not have two, three, four, five, six., etc., instead of 2.4, 3.9, 5.7, etc.?' The answer is that something like four hundred and fifty dollars and a thousand hours of my time, and thirty minutes time each from five hundred artists and supervisors of art and the like, have already been used by us to get the scale as it is! If you wish to get ten samples spaced out equally you have to begin with about five thousand, and even then you may not come out with exact spacing at the end. The result is that this work is excessively laborious, requiring an enormous amount of time of two or three people and a certain amount of the time of a great many people, even to get this far.

A person can utilize this scale of drawing with these irregular intervals just as well, though not quite so conveniently, as if they were in regular intervals. Of course, in the course of time, we hope to fill in and make the intervals even. If we get fairly true zero points and fairly exact intervals we need not be disturbed by inequalities in the intervals. That defect can be remedied by time, labor, and money.

The zero points are, logically, of very great importance and I will say a little more about them. First, let me read the zero point for composition of the Hillegas scale.

This is the result of the judgment of forty professors of English, editorial writers, psychologists, and educational experts. Their consensus is that that paragraph which I will read to you is of zero quality as a composition written by a young person in his teens:

'Dear Sir: I write to say that it aint a square deal. Schools is I say they is I went to a school. red and gree green and brown aint it hito bit I say he don't know his business not today nor yesterday and you know it and I want Jennie to get me out.'

That probably is a little bit above zero. There is a little merit concealed in that, but not enough probably to prejudice the matter seriously!

In algebra I will run down toward zero, although we haven't quite attained it. This is a scale we are now devising for difficulty of algebra problems for students at the end of a year's course in algebra. I will begin up toward the hard end.

'Find the average midnight temperature for the week in which the daily midnight temperatures were 15, 3, 0,—7,—9, 6, and 17 degrees.'

And we go down:

'How much more water must be added to a pint of alcohol pure to make a solution forty per cent pure?'

And then down to:

'A man has a hours to spend riding with a friend. How far can they ride together, going at the rate of b miles an hour, and just covering the return trip at the rate of c miles an hour?'

I will make two or three jumps now and get down to 'E':

'If $2 + \dfrac{\frac{x}{a} - 1}{\frac{2}{a}} = 0$, what does x equal?'

Then:

'If $\frac{1}{a} - \frac{1}{z} = \frac{1}{x} - \frac{1}{b}$, what does x equal?'

And then:

'If $x + 3a = 5a$, what does x equal?'

Then:

'If $a = 4$ and $b = 0$, what does $a + b$ equal?''

And then a still easier one:

'If $a = 4$ and $b = 2$, what does $a + b$ equal?'

The last is somewhere near zero difficulty for a student who has studied algebra a year. In connection with these last problems one may make an interesting observation. The gifted teacher of algebra will know that $a = 4$ and $b = 2$ will make an easier problem than $a = 4$ and $b = 0$. So also the shrewd person, having taught arithmetic, might infer this. The ordinary academic student of mathematics, however, will not believe it. He will insist that the 4 and 0 and the 4 and 2 are the same problem. But the voice of two hundred experts, also the experience in classroom tests, verifies this as a fact. There is a noticeable distance on the scale due to the fact that 'two' in the problem makes it easier than 'zero' does. We have our old friend 'zero difficulty' cropping up and staying on in algebra.

'If a equals 4 and $b = 2$ what does $a - b$ equal? is about one-half space above zero. Probably if the problem were concrete: 'If e equals four cents and b equals two cents, what does $a - b$ equal?,' it would be a little easier. We might make the difficulty still less by not using the symbols a and b. For example, suppose you say: 'If a franc equals twenty cents and a sou equals one cent, how much is a franc and a sou?' That is an algebraic problem. It would probably be nearly of zero difficulty in algebra for a first-year student of a high school, who of course has already had his arithmetic.

I will not say any more about the logic of these scales, and, I think, nothing about their practical use. That will come out in the discussion this afternoon. I will take a few minutes to speak of some of their advantages over the kind of thought we have previously had. Their advantages are, roughly, in the same line as the advantage of the present use of the thermometer over saying 'It is very hot,' 'It is boiling hot,' 'The heat is stifling;' or, the advantage that we gain when, instead of saying a person is a giant, or is very tall, or is one of the biggest people in Indiana, we say that the person is six feet seven and a quarter inches tall, and weighs two hundred and ninety-six and four-tenths pounds. The advantage is that of knowing what we are talking about, of being able to measure change and improvement, and of being able to do both definitely.

In practice, there also is an advantage in that the learner, as well as the teacher, can from these scales define his product. Anyone—the superintendent, the teacher, the parent, the pupil himself—who has any need to define an educational product can do it probably most conveniently by some properly 'unit'-ed scale.

When we began this work we thought primarily of scientific workers in education as being the ones who would make use of these scales, just as the galvanometer was first used only by students in physics laboratories. It was expected that these new units and new scales would find their first service in the hands of scientists who needed especially to measure exactly and to define indubitably. The teaching profession of this country, however, has shown an extraordinary aptitude to take up anything that can be of real use to it in its teaching work, and it has shown that very clearly is the case of these scales. They have been more cordially welcomed and more widely used than any of us would have dared to hope.

This makes it, in a way, especially with this audience, a little unwise to say what I am going to do during the next seven or eight minutes. Still I shall say it, because, hearty as you have all been in your appreciation of the papers read at this meeting and also in your welcome of what I have said, I still imagine that there are many of you who harbor a suspicion back in your minds that after all there is something rather alarming and eccentric and subversive of the true work of the teacher in all this quantitative work.

You look upon these charts which Professor Haggerty has had hung about the room, which are to me a joy and delight, and wonder if they will not in some way infect some of our children with something dangerous! You fear lest educational experiments make children lose their spontaneity, or spirituality, or something of that sort. You feel a certain skepticism, some of you, about these tests and scales. That skepticism I wish partly to recognize and partly to remove.

There is not anything really alarming in changing from the old-fashioned 'I think this is seventy-two and seven-eighths per cent,' or 'I call this "G",' or 'I call this "F",' to saying 'I rate this 14.5 by the Thorndike scale for drawing.' There is another alarming in that. We have all been measuring children. Every time we speak to them, our tone of voice is a measurement in part. We give these measurements, and always must. The question is whether the measurement shall be a precise one, a definite one, one that is comparable with others or not.

There is nothing subversive of a teacher's independence in these new units and scales. You do not do anything worse to a teacher by giving her the Buckingham scale for spelling than you would by giving her a foot rule. You don't injure a person's soul by handing him a foot rule and saying, 'Since you wish to find out how long it is from the tip of your nose to the bottom of your chin I give you this foot rule.' If the person does not need one he is absolutely free to refuse it. Most of them would say, 'It is wiser not to look at the distance and guess at it, but to use the foot rule.'

There is nothing to mechanize instruction in getting an exact measure of the product. Whether instruction becomes dry and hide-bound does not depend in the least upon the instrument used for measuring its product. It depends upon whether we get one-sided, and look too much at certain products and not enough at processes; upon whether we overweigh drawing and handwriting and so forth, as against cheerfulness, good nature, sociability, refinement, and manliness. It is a matter of our ideals. Our schools become mechanized by their aims, not by the manner of instrument they use in measuring the extent to which those aims have been achieved.

In any case we must answer, 'Whether we are suspicious of these things or not, they are coming.' They will be met in every field. At Teachers' College we are working with a thousand problems in arithmetic to get a scale of the difficulty of arithmetical problems. Mr. Courtis has a somewhat similar task under way. Some of you have seen Dr. Russell's test questions in history We are planning to get a set of tests for historical judgment ranging up from: 'Columbus sailed in 1492 from Spain. Columbus got back to Spain in 1493. Columbus discovered America on this trip. When did Columbus discover America?' That is near the zero point of historical judgment! We are going up to such questions as are on this chart, harder and harder tasks, until we get to really intricate political and social inferences.

Dr. Buckingham is extending his work, trying to scale out a thousand or so common words. As you know, from the reading tests, we are getting ready material to work with so that eventually we will have, as a scale to measure range of reading vocabulary, a sheet of paper on which there will be say sixteen lines of ten words each. On the first line, the ten words will all be equally easy to read and very, very easy. On the second line, there will be words a step harder; and so on until we get to hard words 'monachism,' and the like, as our step sixteen. That we shall hope to use for a scale in measuring silent reading with respect to vocabulary. We are also doing the same sort of thing in reading French and German. Professor Hanus, of Harvard, is working on tests that scale the achievement in Latin, both in translation and prose composition.

My impression is that all this will be a gain with no loss, that, teachers will not be influenced by this cut-and-dried measurement at the end to be cut-and-dried in their procedure. We appreciate the readiness of a teacher to seize the happy chance—to know like a general where every part of his working corps is—to have his hand on the pulse of the class room, so to speak. We do not in the least pretend that the old sagacity and wisdom in the class room can be improved or much altered by these units or scales, any more than you will improve the sagacity of a general by giving him a telescope; but you do nevertheless help him by the telescope.

We should not care much for the teacher who did not have a great interest in the finer, subtler qualities of character and taste. At the same time, an artist can preserve all his interest in the fine subtle qualities of taste, and still use the compass points to measure his distances as he draws. Certainly the old rebuke, made in the first days of the child-study movement, that if we were at all scientific with our children we would come to love them less, is out of place. It is not the mothers who love their babies least who weigh them oftenest. On the contrary, the mother who weighs her baby every month, and to an ounce, is precisely in these days the mother who also loves her baby on the average as well as others.

You can then welcome these tests, whether you wish to use them or not. Certainly no person working now in getting them up would force their use upon any teacher. Nobody who is getting them up is doing it for any other reason that that same reason which is guiding your own work in supervision and in teaching—the desire somehow, to some little extent to make school work better. These tests will not replace skill, they will not replace tact, they will not replace kindness, they will not replace enthusiasm, or nobility. On the other hand, they will not in any sense harm us, and they will be useful as helps, no matter how ideal our aims. Our ideals may be as lofty and subtle as you please, but if they are real ideals, they are ideals for achieving something; and if anything real is ever achieved it can be measured. Not perhaps now, and not perhaps in fifty years from now; but if a thing exists, it exists in some amount; and if it exists in some amount, it can be measured. I am suspicious of educational achievements which are so subtle and refined and spiritual that they cannot be measured. I fear that they do not exist. *(Applause.)*

SATURDAY, APRIL 18.—AFTERNOON SESSION

[The conference met in the auditorium of the Student Building, at 1:30 o'clock p. m., pursuant to adjournment. It was called to order by the presiding officer for the afternoon, Dean W. W. Black.]

THE PRESIDING OFFICER: The first topic for discussion by the round table this afternoon is, 'The use of the New Educational Scales in Ordinary School Practice.' The discussion will be led by Professor Thorndike.

ROUND TABLE—THE USE OF THE NEW EDUCATIONAL SCALES IN ORDINARY SCHOOL PRACTICE

DR. THORNDIKE: Mr. Chairman, fellow teachers—This morning I emphasized the logical side of the scale and units problem, what was needed to make a scale adequate to measure with. Now, practically, we have two main considerations. One is, how far need we bother in our practice in getting this exact definition, this exact comparability that I spoke of as desirable. The other problem is, what does it mean to change over from our ordinary system of A, B, C, D, or ninety-five, ninety, eighty-five, and eighty marks.

I will speak very briefly about these two matters by way of provoking further discussion. We do not in practice, of course, need elaborate precision. We do not pretend in school work to measure the product produced with the refinement with which a person measures the exact amount of oxygen that is produced in a certain chemical reaction. We want as much precision as we can get with convenience, but our problem is very largely one of improving our measures without requiring much more time.

The use of these newer scales does improve measures. It improves them in two ways. First, we reduce what we may call the errors of prejudice. By an error of prejudice, I mean an error that acts in one special direction rather than another; as, for instance, when a teacher has a prejudice against vertical writing, or a prejudice against backhand writing. For example, at number eleven on this scale we have three samples of writing, a very pronounced vertical, a partial slanting, and a pronounced slant. Those three are of equal merit by the voice of about sixty experts in judging handwriting. They really are equal. Now, if a teacher who has a prejudice against backhand, or against vertical writing, were given this vertical sample to rate by itself she would rate it far too low. But when she actually sees number eleven in the scale, and has one as good as that she cannot very well call it seven or eight or nine or six. By defining scales we at once rule out certain errors of prejudice.

The same thing occurs in drawing. Most of you have seen this drawing scale of mine. I have letters from supervisors of drawing in American cities saying that they would not tolerate drawings in any of their classes that were not better than the best in the scale! The best in that scale (seventeen) is such as you get from one child in fifty thousand! Now what was the error of prejudice that such a supervisor had? That supervisor had some eccentric notion, perhaps, that drawing was to be done with charcoal, and anything that was not, anything that was done with a flat brush, was beneath contempt; or that drawing was to be done with India ink and Japanese sticks, and that anything that was not little spots of India ink made with these Japanese sticks, was highly objectionable. For some such persons there is, frankly, no cure. At the same time, ordinarily, one that does have such prejudices gets rid of them if he finds that the drawing which he thinks bad, when it is rated by five hundred experts, is placed high. He cannot very well fly in the face of five hundred experts.

If we had had time and if the group had been very much smaller I should have made an experiment here—letting us first measure certain products without any scale at all, just giving them a measurement with no aids whatever; and then making measurement of them later with the aid of the scales. If we did that in the case of handwriting, or drawing, or composition, or the difficulty of problems in algebra, or the difficulty of words to be spelled, or the difficulty of words to be recognized as of certain general meaning, —in each case we should find that after using the scale we got a better agreement, and a changed and improved point of view. The better agreement would be due in part to the elimination of these errors of prejudice, and the changed point of view would be due almost altogether to that.

I was going to illustrate that by the use of one of the scales, but I think I will not take the time.

There are errors of another kind—variable errors, chance errors. If all of us in the room should measure anything, either with or without scales, with any kind of measure that we got of anything that we should measure, we would not get perfect agreement. If I hand you a stick to measure here you will vary in the measurement of the length of that stick. If you are asked to measure that stick to the thousandth of a millimeter you will get a variation of two-thousandths. If everybody in this room should measure the circumference of my head the variation expressed in thousandths of a millimeter would be equally great. Nothing is ever measured in this world where there is not variation. In educational measurements these variable or chance errors are very great. The same examination paper may be rated 60 by one teacher and 90 by another. These variable errors are reduced by the new scales. We will not 'spread out' as much when we use the scales as when we trust our unaided opinion. But I have spoken of that chiefly to point out that it is not the main thing. The main improvement due to the use of a definite set of standards is the elimination of errors of prejudice. They also reduce chance errors, but that is not of so great advantage.

Now, about the manner of changing from our old system of marks over to these scales. The defects in our older methods were first, of subjectivity. One of you gives a certain paper a grade of ninety-six. Nobody knows what that means. Another person might give it seventy-six. In a certain private school for young ladies in the South, whose marks I once investigated, the lowest mark obtained by any pupil was ninety-seven! Ninety-seven in that school was about equivalent to forty-seven in an ordinary public high school.

In the second place, our older personal marks emphasized relative position—who is better than who else. A child goes on from grade to grade and always gets a mark of exactly ninety. What does that mean? Does that mean that the poor child is not improving at all, getting ninety year after year? Of course it does not. All the ninety means is that that child stands with relation to the rest of the children at a certain constant position; better than those marked eighty-eight and less good than ninety-two. What does ninety-two mean? It means better than ninety and less good than ninety-four. The whole thing is rating in terms of others in the class. The teacher may have in her mind, hidden away, some definite idea of what a mark of ninety in algebra, or in United States history, or in handwriting, in grade seven or eight means. She undoubtedly has, but the child has no access to that secret repository of wisdom, the teacher's standard, nor has the parent; and what the child thinks of is that he gets more than somebody else, or less than somebody else (except for one definable thing, that a certain mark passes you to the next grade.) He can tell his achievement and tell his improvement only in terms of being above or below others, which I judge is just the kind of measurement that we all wish to avoid in education.

By the newer scales, of course, the person, if he keeps on improving, would always get a higher mark. In handwriting, for example, he would begin with a certain grade of five, say; and his next grade would be six, and the next grade seven and a half, and the next grade eight and a third, and so on, until he perhaps got up to the grade of eighteen, which represents practically the perfect product produced.

In the third place, the old system by A, B, C, D, E, F, or by one hundred, ninety-nine, ninety-eight, and so on, does not at all serve conveniently for comparisons. This is a result of the subjectivity of the marks. If we had had here in this room the marks in penmanship given to every pupil in this country for every month in the last twenty-five years, we could not do anything with them to tell whether education is more effective in Bloomington than it is in Chicago, to tell whether children are doing any better or any differently in Indiana from what they are in Maine. All we could do with these marks would be one of two things. Where the same pupil was given marks in penmanship by different teachers we could use those marks to study the variability and untrustworthiness of teachers' marks, as has been done by Mr. Gray and other students in the University of Chicago and elsewhere; or we could burn them up. I should suggest we take a small sample to study the uncertainty and variability of teachers' marks, and burn up the rest!

Suppose we should use for the stature of men the world over statements of 'the tallest person in the town,' and 'the next tallest,' 'the shortest person in the town,' and 'the next to the shortest,' and so on. Suppose that we had such statements for all the individuals in the world. We could not tell whether Patagonians were taller than the Japanese or not. A Patagonian six feet six inches might be the tallest person in his town and a Japanese five feet five inches might be the tallest person in his town. If the statements meant anything it would be that the Patagonian six feet six inches and the Japanese five feet five inches were of the same size.

At the present time we are having a struggle to make marks comparable, so that a pupil will not get a five-hundred-dollar scholarship by getting high marks in Greek and Latin when another pupil who really does better work in English and Science but gets lower marks is deprived of a scholarship. We are trying to get uniformity by various means, and one sure, safe means is to make our measurements of educational products like our measurements of length or weight or time, starting from an absolute zero and progressing by defined units. Nothing, I think, could be in the end more practical than that.

I expect to live to see the day when a person will not be recorded as attaining Phi Beta Kappa, or obtaining a percentage of ninety-three in his college course, or having led his class, but when he will be given a clear statement that: 'John Doe can read German passages of the difficulty of passage twenty-eight of the Haggerty-Childs scale; can read French passages of the difficulty of nineteen by the Indiana scale; can do problems in differential calculus of difficulty twenty-seven and a half by the Bloomington scale; can write an English composition in an hour and a half with a degree of merit of 10.43 of the fifty-ninth revision of the Hillegas scale;' and so on. We will send a student out with an inventory of what he can do, expressed in terms that nobody can dispute; and I have a certain faint hope that in those days our degrees of distinction will mean a little more in the educational world, and also in the world of affairs, than they do now.

Of course, this does not mean that in any sense we are going to turn over our school procedure in a week, or a day, or a year, or a decade. But the ideal for school practice will, I am confident, be found somewhere along the line of progress of these new scales.

I had expected when I came here to spend all my time in these round tables in meeting objections. I shall meet them vigorously when made, and I hope you will make them vigorously. The degree of enthusiasm that has been shown for measurement by this group, as I hinted this morning, has been a delightful shock to me, but you need not keep that up now. If it has been done out of courtesy to Indiana University and their Department of Education, or to the Teachers' College which I represent, we are all thankful, and we acknowledge it in this afternoon's talk; but you may attack us all just as violently as you choose.

THE PRESIDING OFFICER: Now, ladies and gentlemen, this is about your last chance. Do not miss it, and don't wait. As you rise give your names.

[The following questions were put to Dr. Thorndike, which were answered as follows:]

QUESTION (MR. CHILDS): Would it be an advantage in the Hillegas scale to have chosen compositions that were all on the same theme?

DR. THORNDIKE: I think so. I have a set of five hundred compositions on one theme. In fact I had those at the time this work was begun. They make the work easier to do and make it a better type of work. At the same time, for certain other reasons, we let that pass.

In drawing I planned to have, under each quality, three types: a picture of a man, a picture of a snowball fight, and a picture of a building; and I believe that it probably would be better. It gives, however, a little more impression of artificiality when you do that, and I advised Mr. Hillegas in the case of English compositions to get a rough-and-ready selection of five thousand samples of writing actually done by the pupils in the high school and by college freshmen, and work from that. I think now that it is better to work through the first scale, keeping the general topic alike, and then add to it by varying the topic. Eventually we should have fifty compositions of the quality of ten, and fifty more of the quality of a hundred, and fifty more of the quality of two hundred, and so on.

We are getting a scale for poems. We want a scale for descriptions, and a scale for arguments. We want scales for business letters, for personal letters and for mere ceremonial letters. We want all sorts of scales. Wherever there is an ability, or skill, or product that needs to be measured, there we need a scale. Of course the task is endless.

QUESTION (MR. HECKERT): Does measurement by the Hillegas scale measure quality of thought, or the paragraphs, or the punctuation, or the spelling, and other qualities of the composition?

DR. THORNDIKE: The question is, what are the qualities of the product that we call quality, merit, in the English composition? Are they thought, paragraph structure, punctuation, spelling, or that subtle thing that we call literary distinction?

I would answer they are that mixture of those things which two hundred of as good judges as we can get say means quality to them. We automatically mix up the notions of two hundred judges as to what they mean by goodness in a boy's writing and take that mixture. We say to the person who is giving the evaluations on which the scale is first based, 'Consider that you are judging the writing of an English paragraph by a boy or girl in his 'teens. Define merit in any way that seems best to you.' So we get an average of two hundred definitions of merit that they are working from, which results in the scale. That was done deliberately, because it has been my practice in all this work to begin first with a 'blanket' scale--a rough, general 'blanket' scale that represents the kind of merit or quality that people in giving general marks have in mind; and then to analyze later. We have carried the analysis one step farther. We have had all these samples marked for content, and then marked again for form, meaning by content primarily the thought, arrangement and organization, and by form the sentence structure, spelling, composition, choice of words, and the like; and we shall have, if Professor Hillegas gets time to complete the work, probably separate scales for samples graded for content, and graded for form. It may be that the grades do not much differ because of a person's point of view in making that analysis. If you come across misspelling in a paragraph that has fine, incisive thought, you cannot, perhaps, count that as heavily against a person as if it comes in a 'sloppy,' disorganized paragraph; so that these two judgments are really very closely correlated.

The two qualities are also closely correlated in performance. Once in a great while, there is a person able to write in flawless style matter of no consequence, but such persons are very rare. The correlation between the two in the work of these pupils is fairly close; so that the distinction is not quite so important as I at first thought it might be; but we can make that distinction.

Also, I suppose it would be well to have certain scales where obviously perfunctory, formal matters, such as spelling and punctuation were entirely excluded. That is, where you actually rewrite the production, correcting the punctuation and the spelling errors, and have it so graded. We intend to do that sometime.

QUESTION (MR. KELLY): I would like to ask you, Dr. Thorndike, if the judgment of a person marking by the Hillegas scale is any more likely to be correct in marking by that scale than under the old method?

DR. THORNDIKE: After a certain amount of practice, yes. Also, better standards for the different school grades can be had by its use. Also, as the Hillegas scale is improved by the addition to it of more samples and more representative samples, its use will become more advantageous. At present, for a teacher accustomed to his own inner standard and not accustomed to the use of the Hillegas scale, there is little gain in accuracy of judgment by the use of the latter. The gain is, for such a person, chiefly in the definiteness and comparability of the resulting measure.

Let me tell you a little story in connection with this. When we were doing this work on the Hillegas scale at the beginning, there were two individuals who were rather skeptical about it. They were asked to grade certain compositions, and they said, 'You cannot do anything like this. Judgment is too variable. You cannot get on in this way.' One of these was one of the best teachers of English that I could find. Another one was one of the most acute men of science in America. They objected to the scaling process. It turned out, however, that those two men were two of the three whose ratings were closest to the rating as by the judgment of the two hundred experts. That is, although they were skeptical about their ratings, their ratings were two of the best three of the two hundred. In all probability, many of you will repeat this experience as you start in rating compositions by this scale; you will feel a certain skepticism as to the value of your ratings, and you will be wise. There are these great individual differences. But as you go on with this work, you will find that those people whom you know to be the best judges are the people who do make the smallest errors; and that means that the process of rating by this scale is sound.

QUESTION: Will we have two scales for the measure of composition, one for originals, and one for a reproduction?

DR. THORNDIKE: The question concerns originals and reproductions, and whether you should have separate scales for the two. Yes. As a matter of fact, however, there is not so much need of that, as one would see at first sight, suppose. For example, take the Joan of Arc passage. Very few people take that to be a reproduction at all. As a matter of fact I do not absolutely know. It may be or it may not be. It probably is, if you so consider it, but the majority of judges rate that particular composition very high in either case. Of course, the attitude toward the product will probably influence our ratings, and so we probably should consider all these as originals, or consider them all as reproductions. In one sense it need not make any difference how they are made, whether these samples were written by man or beast, whether they were written by a person who was sober or intoxicated, whether they were copied from a book or written by the person; we are grading samples, not pupils. At the same time, the attitude toward the sample as an original, or as a reproduction, will of course vary, and probably it would be best to consider them as originals and not to have any reproduction passages in the scale. It is rather hard to live up to that idea. We started out with five thousand passages, and we got down to a rather pitiful number at the end. If we had thrown out reproductions, where would we have been? That is the reason for it. At the present time I am making a collection of school work in English. We are trying to get a very large collection of actual original work by pupils in their 'teens.

QUESTIONS (MISS BAYLOR): What is the method, Doctor, for obtaining samples for your graded scale?

DR. THORNDIKE: I will take the drawing scale as an illustration. I would begin by getting about forty people of good judgment—whether they know anything about drawing or not, is not important; psychologists, fellow educators, teachers, supervisors of drawing—to go over a set of about twelve hundred drawings and rate those. We have to begin with an enormous number. That leaves you, we will say, with fifty or sixty drawings which seem to 'tail out,' which seem to represent a graded series. I would take those fifty or sixty that were left as the first draft of a graded series. I would submit those in this particular case to fifty or a hundred good students. It would not matter whether they were experts in drawing or not, so long as they were level-headed, common-sense people. Thus we get down to about thirty drawings that seem to space out specially well, say like this (the speaker here illustrated the matter at the blackboard). Now we want to get something like equal intervals, and we will take one out here, and one out here, and one here, perhaps this one, and then this one, and we will need another one there. We have then a set of a dozen or so drawings spaced out from one of about zero merit to the best we find in children's work. Having got such a set, I then sent a personal letter to two hundred and fifty teachers of drawing in American cities, and also to two hundred and fifty of the eminent artists of America, and told them that I disliked to bother them, as I truly did, but that it they wanted to give me ten minutes of their time I would be obliged. We got thus a group of two hundred and fifty supervisors of drawing and two hundred and fifty painters, and then we tried to get a group of general intelligent people—people whom I knew in science and in affairs and education, whose judgment I would trust about drawing or anything else. Of course, only a moderate percentage of these replied to my request. My final scale was made up from a group of one hundred and sixty judges of these three sorts. We get a provisional scale by the judgment of a fairly able group, and a final scale by the judgment of a mixture of special experts and individuals of general good judgment.

In handwriting we worked through teachers, graduate students of education, and the like, first, up to the final group of scientific men, editors, teachers, and supervisors of English in secondary schools of very high grade. That stands as our final decisive group.

THE PRESIDING OFFICER: I know there are a number of friends from other institutions here, and from other cities, and we will be glad to have them take part in the work. Professor Heckart from Miami University, and Professor McLean from the Cleveland Teachers' Training School, and Dr. Courtis are with us, and Superintendent Holland of the Louisville Schools. We would like all our friends to take part in the discussion, and also fill out a registration card in order that we may keep in touch with you. We will be glad to hear from anybody else. We have plenty of time yet. I notice Professor Sandison from our State Normal School is present. We would be glad to have him take part in this discussion.

QUESTION (MR. SCHOLL): Doctor, please explain how this data that you have given us may be obtained later in a systematized form.

DR. THORNDIKE: I am asked about convenient means of obtaining this data. I had better give some information on the cost also of getting these materials. This handwriting scale can be obtained from the Teachers' College Bureau of Publications. They charge seven cents for one of them, sending it postpaid. In large quantities you can get them for five cents apiece.

The Ayres handwriting scale is obtainable for five cents, I think, from the Russell Sage Foundation, New York City. Its samples are somewhat too small and too crowded together to judge by, but, being so much smaller, the Ayres scale is more convenient to use, in case you are carrying it around with you.

The Hillegas composition scale can be had of the Bureau of Publication of the Teachers' School for, I think, two cents—one cent for the scale and one cent for postage; or maybe three cents.

As to these drawing scales, I am not sure whether those are now issued separately or not. A full account of that work, its use, etc., is in the Teachers' College Record for some time about four or five months ago—I don't just remember just when—November, I think. That entire number can be obtained for, I suppose, thirty cents. If you will send five cents and say you want a copy of the Thorndike drawing scale you will probably get it, perhaps with a bill for two cents more. Along with that is this extra sample which is to be used in filling out the scale for your purposes. I don't know whether those are on sale or not. I am sorry to be so indefinite about these items of sale and cost, but I assure you that it is work enough to get these scales made, without paying any attention to whether anyone ever afterward uses them or not. *(Laughter.)* If I get them made I have done my share.

Mr. Buckingham's article on spelling, 'Spelling Ability: Its Measurement and Distribution,' is a long and rather elaborate account, which is obtainable also from the Teacher's College Bureau of Publications, and costs about one dollar. I will give you now, for those who want to take them down, the actual sentences we should use for class tests. This series alone would not serve for tests of individuals. It would not place the individual correctly.

The first four words are the words 'send,' 'forty,' 'pass,' 'front.'

These words for children in and around New York City, tested in the early part of the grade, are the third-grade key words. That is, at about the first two or three months, say, of the third grade, call it about the third month, fifty per cent of the third grade children will spell those words correctly and fifty per cent will fail on them; so that we may call that the median standard for the third grade. They are given in sentences as follows:

'I will send forty men.'

'Please pass in front of me.'

That is the way Dr. Buckingham gives them. If a word is omitted or illegible it should be marked wrong. The words for the fourth grade are, 'wear,' 'button,' 'touch,' 'surface.' The sentences are:

'He likes to wear a white button.'

'The rope can just touch the surface of the water.'

That, you can call the fourth-grade standard, in that there will be fifty per cent of successes and fifty per cent of failures in the fourth grade, as found by Dr. Buckingham. I notice that the pupils in the Bloomington schools are very much better!

For the fifth grade the words are 'believe,' 'loose,' 'circus,' 'carriage,' given in the sentences.

'I believe that your belt is too loose.'

'They drove to the circus in a carriage.'

That is the fifth grade standard

The next is for the sixth grade. The words are 'saucy' and 'whistling,' and the sentence is:

'He laughs and is saucy and keeps on whistling.'

The next two words are 'beginning' and 'succeed,' and the sentence is:

'They may fail in the beginning, but soon they will succeed.'

Those two sentences, with the words 'saucy,' 'whistling,' 'beginning,' and 'succeed,' form the sixth grade standard.

For the seventh grade the sentences are:

'While ascending the stairs he slipped.'

'You cannot imagine a person with so bad a character.'

The words are 'ascending,' 'slipped,' 'imagine,' and 'character.' Those are the seventh grade median words.

For the eighth grade the first sentence is:

'He made a peculiar mixture of ashes and cement,' the two words being 'peculiar' and 'cement.' The second sentence is: 'The intelligent scholars were all present on this occasion,' the words being 'intelligent' and 'occasion.'

Now, finally, for a super-eighth, or a little higher standard still:

'I can guarantee that this girl is thoroughly conscientious. She will never disappoint you,' the words being 'guarantee,' 'thoroughly,' and 'disappoint.' That represents a 'grade step-up' scale, you might say, a step of one grade of difficulty in each case.

The Buckingham scale is the most interesting one in construction. Those of you who are serious in this will enjoy reading that more than these earlier articles by Professor Hillegas and myself.

Professor Hanus, of Harvard, is working on scales in Latin. There is a brief report published, I think. Mr. Hanus has talked with me so much about this matter that maybe I am in error about having read an article about it. At any rate, from Harvard University in the near future we may expect some sort of scale for ability in reading Latin. Do you know about the publication of that work, Professor Childs?

PROFESSOR CHILDS: It will be found in the copy of the proceedings of the College Teachers' Section of the Superintendents' Division of the National Education Association held at Richmond, 1914.

DR. THORNDIKE: In the journal called School Mathematics, again, sometime within the last six months, there is an article by myself reporting a scale for measuring algebra, but reporting just the bare beginnings of such a scale. In the *English Journal* there are two good articles, one a critical article by Mr. Johnson, Principal of the University High School. That would be about two years ago in the *English Journal*. Later there is an article by myself about some work in the extension of the Hillegas scale, in that same *English Journal.*

THE PRESIDING OFFICER: I wish to say for the benefit and ease of those who expect to leave Bloomington on the 4:14 train that our exercises will have closed in plenty of time to enable you to reach the station in time for that train; and for your further comfort I will say that there will be an extra coach on that train leaving at 4:14.

We are now ready for the last of the exercises on our program, and if I felt that I could in any way say something that would express to you more than you already know of our feeling of appreciation of the intense interest and undivided attention that you have given to this conference I should be glad to say it. In behalf of the University I do thank you sincerely for your attendance and your expressions of appreciation of the work that has been done here. We hope to duplicate it at some future time, and I assure you we will let you know when that time comes.

Next on the program is a lecture by Dr. E. H. Lindley, Professor of Psychology and Philosophy, Indiana University, on 'Individuality, Leadership and Democracy.' We will be glad to hear from Dr. Lindley. *(Applause.)*

INDIVIDUALITY, LEADERSHIP, AND DEMOCRACY

PROFESSOR LINDLEY: Mr. Chairman, ladies and gentlemen—I have a rather difficult and ambiguous function assigned to me by the program committee, namely, to follow up and bring up any odds and ends that might call for notice or emphasis—I shall not dare to say 'sugar off' any of the discussion that has already precipitated itself so admirably in your minds—but I have gone to press at the last moment in order to say a few things in rather a propositional form concerning the impression which this whole problem of measurement makes at least on one mind—a mind sympathetic with this whole idea of standardizing every phase of life.

I should say as proposition one, that the most powerful impression of all these measurements as applied by the master men who have been here, Mr. Thorndike and Mr. Courtis, has been the re-emphasis of the supreme importance—not of averages, but of individuals. I think that emphasis is often lost by second-hand use of these standards, and so I feel like spending a moment on that particular point.

The first evening of the session Mr. Courtis brought home to us with great vividness, as perhaps the supreme result of his studies, the diagnosis of the individual, the discovery of something wrong with the individual as regards a given process, and the problem of a separate and differential examination of each individual case on its own merits; and I am sure that the address last evening by Professor Thorndike, which you will long remember, brought that home to us again, beyond any danger of our forgetting it.

And yet I think that the philosophy out of which grew the first measurements and the first dealing with standards was a philosophy which did not philosophize on the importance of particulars, or of the concrete, or of individuals. The most of us were brought up in an atmosphere of abstractionism, whereby in spite of even the best teaching we continued to believe in formal abstractions of every sort. A law was something over and above the concrete phenomena which it attempted to describe; and we lived in a double world—a world of these laws, and then the world of concrete things. It has been one of the redemptive functions of the philosophy of our time to reveal the supremacy of the individual, of individual influences, and individual persons again. I suppose that would be one of the most important services of William James' philosophy, the clarification again of the concrete; that these laws are, after all, only shorthand ways of describing the behavior of concrete atoms, or molecules, or animals, or men.

And as I say, we are prone to the pitfall of abstractionism, to believe that somehow when we get an average, or formulate a law, that we can separate it from the concrete fulness of the thing which the law is simply designed to describe from a certain angle. So I say the future advantage of any sort of measurement we choose, this future advantage I suggest and emphasize, which will result from the work of these master men, lies in the fact that these measurements bring home, above everything else, the primacy of the individual. That is point number one.

At the risk of seeming just a little flamboyant and exuberant.

a little sentimental in my attitude toward individuals, I want to read what Chesterton has said. Chesterton himself is not very exuberant in his idealism. He is inclined at times, you know, to be a bit cynical. Yet once upon a time he said this, which I believe well serves as a keynote of this Conference:

'I do not believe that there are any ordinary people. That is, I do not believe that there are many people whose lives are really humdrum or whose characters are really colorless. But the trouble is that one can so quickly see them all in a lump, like a land surveyor, and it would take so long to see them one by one as they really are, like a great novelist. Looking out of the window, I see a very steep little street, with a row of prim little houses breaking their necks downhill in the most decorous single file. If I were landlord of that street, or visiting philanthropist making myself objectionable down that street, I could easily take it all in at a glance, sum it all up, and say 'Houses at £40 a year.' But suppose I could be father confessor to that street, how awful and altered it would look! Each house would be sundered from its neighbor as by an earthquake and would stand alone in a wilderness of the soul. I should know that in this house a man was going mad with drink, that in that a man had kept single for a woman, that in that next a woman was on the edge of abysses, that in the next a woman was living an unknown life which might in more devout ages have been gilded in hagiographies and made the fountain of miracles. People talk much of the quarrel between science and religion; but the deepest difference is that the individual is so much bigger than the average, that the inside of life is much larger than the outside.'

The sneer of Bisilides, 'I speak for one in a thousand, the rest are dogs and swine,' is the voice of an aristocracy that is dead or dying; and in the spirit of this new conception of the worth of the individual we who are agents of public education live and work. We speak not for one in a thousand, but for everyone in the thousand, with a faith more or less defined that each individual has a unique work in the social order; and that it is the great problem of education to find that place, to pioneer the way from this man's individual gift to his supremely useful task in civilization.

Now the second proposition that I should like to make is that we have some conception now of the causes of individual differences —Darwin's law of variation was a convenient mode of stating that —and we have come to see that nature when she wishes a task to be accomplished leads her men with a bias, and that that is a supremely important thing—not merely for the man, but for society. We have come to see that there are two kinds of individuality in the world. There is what Cowley calls individuality by, or through, isolation: the individuality that you find in the wild plant that grows up without pruning, that you find among individuals in stagnant communities everywhere—an ingrowing kind of individuality, intolerant of differences, wild, sometimes fruitful but rarely so. There is then, that kind of individuality through isolation. And by contrast, there is another kind of individuality, individuality through choice, which is the product of training, of pruning, of cultivation; and it is the supreme aim of education, of course, to transform the individuality of isolation into the individuality of choice. Emerson says somewhere that the pest of society is its egotists, those unpruned champions of a unique function in the social order; and one might add that the salvation of society is individuals with their oppositions reduced, their excesses pruned away, and all impediments removed, leaving nothing but pure power.

I submit, then, that the problem of individuals and individuality is the production, through choice, on the basis of the knowledge of the heredity and the present composition of the individual, of the best individual that that man can be under the existing social circumstances.

Point number three. The differentiation and specialization, of course, of individuals is widest among human beings, because of the complexity and richness of our heredity. The range of variation in a given cosmopolitan city is wider than you will find anywhere else in the world among living things.

The artificial reorganization of society which is reflected in industrial organization, and the like, has given us not a few simple human functions, but over thirteen thousand vocations; and one sees, then, that the strategy of education is the adjustment not of any kind of individuality to a generalized situation, but in the long run, the adjustment of the individual for one of a determinable number of possible niches, or places, in this social order that have been largely defined and determined by the organization and evolution of society and industry. So our task is set out for us. We are born into a world already richly organized and calling clamorously for types of individuals, and the tragic fact is that multitudes of these types have not been produced in sufficient number. The fact that the great organizations of the day have their lookout bureaus for the discovery of men of particular combinations of qualities, and that they find it difficult to discover these men, is a commentary on the maladjustment that exists today in the social order, and the social waste due to this and the loss in happiness is beyond imagination.

Now, the next point that I wish to make is that the production of choice individuals, adjusted to the social order, is a function of the ferment, or leadership, which is going on under our eyes all the time. The shaping of the individual is largely produced, not by his physical nature and environment, as we know, but by his social stresses.

A few years ago Mr. Terman made a study in the Bloomington schools of leadership which he afterwards published. As some of you may know, we arranged in little groups of four each, pupils were selected for us by the teachers of the various grades. They were given simple tasks which involved a certain kind of initiative, and we discovered that in every one of these little groups there would be a leader and there would be clear cut followers; and that this leadership, as determined by these groups, was confirmed by the independent testimony of the teachers as to who were the leaders in those grades, and checked also by the testimony of the pupils who were asked this question: 'If you could not be yourself who would you rather be inside of this room?'; and they chose several times oftener these leaders than any other. And we found this interesting fact, which is commonplace, but I dare speak of it because it is so fundamental, that the leader in group 'A' when changed and placed in group 'B' might no longer enjoy leadership. He would become a follower. There was the picture of transient leadership and eclipsed leadership going on in these little social groups that were more or less artificially arranged.

We correlated that and interpreted it in the light of what we know of animal behavior, and the dual functions of invention and imitation. Animal leadership had given us some hints. Wesley Mills took a mongrel puppy and kept it away from the others for thirty days. Its development was very backward; but when he put it back in the group of its fellows he said its progress was by leaps and bounds. Thus the social stimulus of the group leveled up its backwardness, practically bringing it up to the level of the best in that group. In one early observation of Lloyd Morgan, when Blackie—the more adventurous of a little brood of chicks under his observation—would tackle a new kind of food, that was the signal for the others to follow suit. And Blackie learned to drink. as we know from Morgan, by standing with his feet in the water pail, and pecking at his toes, accidentally found the water. The rest of the brood, had been restless with thirst, but they had not walked down to the water until Blackie made its discovery. The pecking function was innate in Blackie, and Blackie pecked at his toes and took the water up with his beak; and according to this observation, which has been in controversy in some quarters, this thing happened, and very soon the other chicks were drinking.

We know from animal leadership in other fields that the function of imitation is a levelling up function whereby all the members of the group tend to share in the achievements of the most adventurous and most original of the group who is the leader for the time; and so we have the picture of inventiveness and imitation as the two legs on which the mind walks forward.

They have down in Texas a saying that the best steers are always on the outside of the bunch. There is where there is risk. They are facing the hazards of new fortunes, out in the presence of danger. The fact that they are out there, the fact that they have potentialities and qualities not possessed by those who are only happy when buried in the bosom of the herd, is the reason why they are the potential leaders

Here we have a picture of a general kind of leadership growing out of this, which is the traditional view of leadership, namely, that all mankind may fall into two classes the leaders and the led, the inventors and the imitators, the voices and the echoes, the poietic and the submissive, the sulphites and the bromides.

But we have fallen into the error of assuming that these classifications are permanent and fixed classifications. There is, indeed a certain measure of truth in the fact that certain men and women are endowed for a general kind of a leadership, like Napoleon, Bismarck, Caesar, and a host of others, men who have complimentary qualities of superiority; for as Dr. Thorndike expressly pointed out the other day one superior quality is generally correlated with others, and you may expect a certain number of men, within reasonable limits, to have this general quality of leadership.

But I wish to submit another view of leadership which is vital to any understanding and adjustment to life and democracy. Let us call it differential leadership or distributive leadership. An illustration may best serve. As I looked out of my study window, through several seasons, I saw four boys out at play. One was a very vigorous, muscular, rather gross boy, a great hearty fellow with great physical strength and physical courage; and there were two boys almost of a size who were very active. They were motives and hustlers. And the fourth boy was a thoughtful boy, of fair strength, with a good deal of interest in outdoor sports, but his mind filled with lore and story and that sort of thing. I saw from day to day this thing going on: Whenever the play was a play of activity and took the form of feats of physical strength there wasn't any question as to who was leader of that group. The large boy set stunts and 'stumped' the other boys at certain things. They were soon jumping what seemed to be impossible hurdles. They were not to be bested, and this boy was thus leveling up these others to something like his plane of physical courage and physical endurance and strength.

Now, when it comes to a form of organization play, the organization of a circus or a store or whatnot, there wasn't any question as to who was the leader. There was no dispute about it. These two little boys were the administrators with their hustle and their business lore. They had many opportunities which the others did not enjoy for learning the tricks of business, and plans, and all that sort of thing, that they put into the game; and thus the other boys were taught and leveled up in their business experience and administrative activity to somewhat the altitude of these temporary leaders.

Now when the ordinary plays were out of the question, or there was a necessity for drawing on some new resources, the fourth boy was brought to the front. If it were a question of story telling, a question of detailed knowledge of certain things, this other boy was the unquestioned leader; he was the teacher who leveled up the whole group to himself along those lines.

Now, I submit that is typical of the differential kind of leadership, and I submit also that all the study made from the time of Bryan's studies of telegraphy up through these recent studies show this, that unless the human kind can enjoy the prestige of leadership in some respect some time, that mind will be a retarded mind, I don't care how fortunate the surroundings are.

And the second phase of that is this, that the variety, the combination of individual qualities, are so well nigh infinite in human society that theoretically it ought to be possible in a democracy with blended stock such as ours is, to find in every individual in every school some respect in which a given individual is superior to other individuals in a social group; and until that is done, and until that child has a chance to enjoy the prestige of leadership, differential leadership in that respect, you cannot expect normal development of his mind and his will.

Now I submit that sets a difficult problem in analysis, but nothing short of this is going to serve for every human life must have its chance for complete and personal development.

I don't know how many would accept that doctrine of distributive and differential leadership, but we have got to surrender in some measure this doctrine of general leadership for this more democratic doctrine of differential leadership which must lie at the heart of our program of education for the years that stretch in front of us.

Now, the next point that I want to mention is that all the evidence that we have, and it is growing in amount, is that the actual amount of talent in the world today is probably equal to the task which civilization calls for. I have just spoken of this enormous application of specialization in the work of the world. I have said that we not only find sufficient response from individuals, but all the testimony, direct and indirect, goes to show that there is actually in existence in the world today these individual differences, these types of individuals who are, or should be, connected up with these vocations where they can best serve in the social order.

Now, there is a good deal of evidence that the vitality, the ratio of vitality of the dominant races today, in spite of the vices that have blocked social progress and the like, the ratio of vitality is as high as it has ever been in history. It is an astounding effect of the resiliency of our stock. You keep it repressed for a hundred years, but when you relieve the pressure that stock that has been through the fire and flood and storm for unknown generations will assert itself anew. Lincoln Steffens tells us in a recent study of decadent New England that this so-called stagnation of individuals in New England in his judgment is not essentially decadence; that if these people had the tasks which confronted their pioneer forefathers, they would rise to them; that if you would turn this same stock, which has been two hundred and fifty years in Connecticut and New Hampshire, if you would turn them loose in Alaska you would have a re-assertion of that wonderful efficiency again. The power is there, though dormant. There is evidence that it is there awaiting the right stimulus. So the problem, of course, is to release all these energies which are now confined. Odm said that only about one per cent of the talent of France was released, and Golton said only about ten per cent of the talent of England was in action. The problem is to release all these forms of energy, and secure that training, social adjustment, and selection whereby these may be fitted for the social order.

Now, the next point that I wish to make is that society is all the time selecting certain of these individuals at the expense of other types. Professor Thorndike called attention last night to the fallacy of assuming that you have separate groups of varieties of individuals; that all you have is a theoretical series. Well, as a matter of fact, when it comes to dynamic individuality, society through its selection is producing separate varieties right along. Let me illustrate. I think it is a matter that can be confirmed by your own observation. Take the profession of medicine, for instance, you find in many a community a desperate competition between the high class physician and those who are near high class; it results often in the elimination of those of the near good type; but this competition does not affect the herb doctors in that community. These latter constitute a separate variety. Society will tolerate and select a scientifically trained physician, and when it does chose that type it wants the best; and so the men who are the near best are the ones who feel the impact of severe competition. They have to emigrate or do something else—go into politics, or do something. On the other hand, the herb doctor flourishes, and the quack is still with us. Now that is true of many other social types. If one were to survey the *post bellum* types in this country, the political type, the capitalistic type and the like, the psychology of these types would be quite different from that of the land owner type of long ago that dominated England. It was a different combination of qualities, and these when they won prestige, were imitated by children, and the whole attempt of education, or the unconscious pressure at any rate of social selection, was to make children into the image of these successful men. But in ten years we have had a revolution in our doctrine. Ten years ago Charles Schwab was telling us what higher education ought to be; and the other day a millionaire of Cincinnati said it is really getting to be unfashionable to be a millionaire in America unless you can explain how you got it.

From time to time you have to put on new types to fit new conditions. You take a stagnant backward community, and if it happens by some happy chance that certain varieties of men have won success there, you have a selection of those types; and if a boy grows up with any other gift he has to go away from home to get recognition; and the social cost to that community of the expulsion of that type will be very great.

Suppose the elder Wright had been born in the Orient, we would never have heard of him, because they are not a mechanically minded people, and would not have been interested in his work; so you have social selection and destruction going on over this very wide area of the combinations furnished by heredity; and so probably all the public education of every sort is hostile to the coming types, the types that are to be of use.

Anybody can judge the value of a man who has already arrived, but we are told that the successful men in business everywhere are most successful if they are able to judge the coming man, to evaluate the product in advance, whether a man of a certain new type will arrive in time to meet a new situation. It thus becomes evident that the problem of individual differences in the school is, as Professor Kelely put it, the problem of vocational guidance. You can tell in the high school, perhaps a little lower down, the special gift, and you can, if you have some knowledge of the social situation, make some adjustments there in time.

Most of the mistakes in the world today are, of course, due to lack of counsel and lack of foresight in the counsellor. That is not the fault of the school, but of society as a whole I submit this additional fact, that nobody can be a vocational guide without knowing the social situation of the child. I think as a matter of history the best teachers have been better vocational guides than fathers and mothers, because the fathers and mothers have been so much like their children that they have not been able to form a good objective judgment; but the teacher is close to the life of the child, and when peculiarities of combination appear the teacher can value them even better than the parent, and has actually done so. But I submit you cannot be a good vocational guide unless you know the social situation; that you cannot serve democracy unless you 'know a good man when you see him,' as William James says, and that is not to be learned in the school alone. It is not to be found merely by the study of books on social theory alone. This power of judging has got to be kept alive and developed just as it is in the world outside, through actual human contacts in vest variety. The teacher is compelled by this view to enlarge the conception of the vocation of the teacher, to live in the world in a sense that many have never done before.

We are in a changing social order. A great many people tell us we are in the midst of a social revolution. We are sloughing off the remnants of the old leisure class theory of society. We have come to see that culture is not the cloistered thing, that as one of the most eminent scholars in the world said a few weeks ago, 'You remember when I was lecturing a few years ago I was under the spell of German culture; I was lecturing about the glories of pure science, and all that sort of thing. I am now ready to say there is no such thing as pure science. I think it is intolerable now for us to sit quietly when some man says he thanks God that what truth he had discovered will never be of any use to anybody.'

That is to say, here is a conception that science has grown, not out of the leisure of cloistered men who have been served by slaves; but science, as distinct from philosophy and the fine arts, has grown out of the heat of the struggle of men in actual work. Science is the democratic member of modern order. Science has been determined by need. It has been close to facts and it has always turned back to serve society.

We have, thanks to science, a new conception of the social order and of civilization. Civilization is not a place for over the teacups contemplation of life for man, but it is a gigantic conspiracy and co-operation for the complete conquest of nature, of human nature, in the spirit of the arts and science and culture, the idealization of the work of the world.

Now, when you get that conception securely lodged in your mind you see that that sweeps away at once any lodgment for a drone or a parasite, and constitutes the most magnificent program of campaign that the world has ever seen. You see what William James had in mind. Never again in the history of men will vast millions of men voluntarily come together to fight. Perhaps never again will vast millions of men organize merely for worship. The man on horseback falls back, and the engineer comes to the front; the mechanical engineer, the social engineer, the spiritual engineer. The old morality of repression, the old morality of self assertion, of the politician, makes way for the new morality of the builder. As Dr. Carver says, 'The fighter has had his day, and the talker has been having his day, and the new day of the producer has come.'

So the whole problem of education, the whole problem of civilization is a problem of organized work on the level of types efficient for every individual; and I say that program is a drum call.

Out in Arizona at one time somebody asked the President of that University if the boys there took an interest in baseball and football. He said, 'No, the members of the faculty who have come from Harvard and Princeton and Yale do, but the boys have been full of the passion to master the desert, and they are hustling today like football men in a big game in the conquest of the desert.

Now, this conquest is not merely of the work of the world and the spiritualization of the leisure of men. The waste there and the cost there is beyond imagination. We are spending more today for moving pictures than we are spending for the salaries of teachers for all this whole country. There ought to be some retrenchment. We spend more for pleasure temples than for the teachers in the colleges and schools of every grade in this country.

And so the readjustment of the social surplus to secure this ideal of culture which is not of spiritualism but of every kind of work of men, sets a problem which I submit is a clarion call which to many of us is supremely important, superior to that of the military.

And now, finally, I should like to say that out of this social order there are to come the grace and beauties equal to those of the old order, without any question. Charles Elliott Horton, an eminent man of wonderful refinement, a man who was sometimes impatient with democracy with all its greed, said these words with which I close:

'As time goes on,' he said, 'and democracy reaches its full development, there may be just as complete gentlemen in the sense of high bred men as in any aristocracy with its long traditions.'

And so we have as one of the weapons of defense in this new faith this old vision of the method of clarification which has as its chief service, at last, the discovery of individual differences in the ranks, and the clarification of the aims of the people who use the standards

When Harrington Emerson was here some time ago he said there were eight different ideals in cooking, and you have to have each aim in mind if you are going to have a good job. There are many more aims than that in teaching, and it is the merit of this service that it enables us to choose our mark and then shoot with a rifle instead of a water nozzle. The whole problem is to adjust the order that already exists, highly specialized, with an individual variation almost infinite in number; to make the adjustment of one to the other in the service of this ideal culture which clarifies the work and which spiritualizes nature. *(Applause.)*

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11 } INDIANA UNIVERSITY BULLETIN { 1915

SECOND ANNUAL CONFERENCE

ON

EDUCATIONAL MEASUREMENTS

Held under the Auspices of the

Extension Division of Indiana University

AT

BLOOMINGTON, INDIANA, FRIDAY AND
SATURDAY, APRIL 16 AND 17, 1915

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"These tests will not replace skill, they will not replace tact, they will not replace kindness, they will not replace enthusiasm, or nobility. On the other hand, they will not in any sense harm us, and they will be useful as helps, no matter how ideal our aims. Our ideals may be as lofty and subtle as you please, but if they are real ideals, they are ideals for achieving something; and if anything real is ever achieved it can be measured. Not perhaps now, and not perhaps in fifty years from now; but if a thing exists, it exists in some amount; and if it exists in some amount, it can be measured. I am suspicious of educational achievements which are so subtle and refined and spiritual that they cannot be measured. I fear that they do not exist."—E. L. THORNDIKE, in Proceedings of Indiana University Conference on Educational Measurements, 1914.

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Second Conference on Educational Measurements

FRIDAY MORNING SESSION

The conference was called to order by President Bryan, with the following words of welcome:

President Bryan: Ladies and gentlemen, it is certainly a great pleasure for us to welcome you here for the Second Annual Conference on Educational Measurements. It is a fine thing to find the leading school men and school women of the State ready to meet together for the study of the problems with which they have to deal.

I do not believe that there is any profession whose members are more ready to examine again and again the foundation principles of their work, and to find out new and better ways of doing the things which are committed to their charge.

It has been a great satisfaction to me in these last years to serve as a member of the State Board of Education under the able leadership of the State Superintendent of Public Instruction, and I am especially happy this morning to introduce to you as your presiding officer Hon. Charles A. Greathouse, the Superintendent of Public Instruction of Indiana.

ADDRESS OF PRESIDING OFFICER

Mr. Greathouse: Mr. President, ladies, and gentlemen, I consider it a distinct honor to be invited to preside at this meeting, and to introduce the distinguished speakers of this morning's session.

It is fitting that this meeting on educational measurements should be held under the auspices of our own State University. I am glad to see so many teachers, principals, and superintendents present. It assures me that you are interested in any progressive method which has for its purpose the betterment of our educational system.

I congratulate you also on being connected just at this time with the school work of Indiana, for at no period in the history of our educational system has there been more harmony in our affairs, and more substantial growth in our system than we have in Indiana today. In my report to the Governor of the State, which will be issued shortly, I have found that last year we had enrolled in the schools of Indiana more than five hundred thousand boys and girls, with an average attendance of more than four hundred and eleven thousand; and that these pupils were in charge of more than seventeen thousand educated and qualified teachers, who receive out of the public treasury of Indiana every year more than $7,000,000. In addition to this we have established in eighteen cities vocational centers with one hundred and seventy-five teachers and more than seventy-five hundred students, consisting of men and women, and boys and girls. At the next meeting of the State Board of Education, we will have approved eight vocational schools for instruction in agriculture with a full corps of teachers and a large enrollment of pupils.

What an admirable system we have! Our State is dotted thruout its length and breadth with district schools, high schools, colleges, and universities, all working to the same end. When we reflect upon the enormous amount of money now expended and upon the great army of men and women at the present time engaged in the school work in this State, we cannot but be surprised to remember that there ever was a time when there were no schools of this system in existence, and when a governor of one of the colonies could be moved to thank God we had no public schools in America. In the light of what has taken place since his day, we cannot but be surprised to find such an utterance in history. But we must remember that that was due to an old political idea. A new day has come. The old system of government of the Middle Ages had been to treat the people merely as serfs. The era of political freedom has changed all that. The great idea of popular education in the interest of free government has found its way into the hearts and minds of the people. It was the governor of the colony of Virginia who thanked God that there were no public schools in America, and he foolishly believed the less the people knew the easier they were to govern. But when the Mayflower landed at Plymouth a wiser voice determined the character of the government in that province; and it may be that the Pilgrims saw clearly even then the vital relation between education and government.

My friends, I have an abiding faith in the public school system as a civilizing agency, as a preparation for the duties of citizenship. The uncomplaining contributions of the masses for its support shows an unselfish concern for future generations. It means to them not only the preservation of the republic now, but its perpetuation. To keep this sacred department of our government free from politics, divorced from graft and every other form of corruption, should be the firm resolve of every man connected with the school system of Indiana. The commercialism of the day should not be permitted to spread its influence over this most important department of government. The management of our schools should be with an eye single to the education of those upon whom the responsibility of government will soon rest. The subject of our public schools is one of commanding importance. It is nearest the heart, since it concerns every household in this State. In all the vicissitudes of politics, amid the bitterness of partisan strife, the management of our schools has ever commanded the love and veneration of our people; and whatever changes may hereafter take place in our form of government, whether by peaceful means or by force of arms, the people will never surrender free education.

Now, ladies and gentlemen, I apologize for taking so much time. We have this morning two distinguished speakers. The first gentleman on the program needs no introduction to an audience such as this. I regard him as one of the strongest men in the educational field. Ladies and gentlemen, Dean W. W. Black, of the Indiana University School of Education, who will address you on "The Movement for Greater Economy in Education".

THE MOVEMENT FOR GREATER ECONOMY IN EDUCATION

MR. BLACK: The present movement in the study of Education seeks economy from four points of view, viz.: (1) economy thru the quality of the product, (2) economy in quantity of the product, (3) economy in time, and (4) economy in the expenditure of energy.

These four economies should move together, each in harmony with the others, and each, therefore, serving as a check on one or more of the others. For example, quality demands that the pupil be taught to write well, but quantity, time, and expenditure of energy demand that he does not write too well. Quantity and the writer's time demand that the pupil develop speed in writing, but quality, demanded by the time and expenditure of energy of the reader, insists that he does not write too rapidly. In the matter of style, quality demands that the writing be most legible. This demand was, I think, the cause of our substituting, some years ago, the vertical system for the Spencerian slant. But vertical writing, while most easily or rapidly read, failed to satisfy the demands of quantity, or speed. The demand of speed alone would have carried us back to full slant, for full slant permits greatest speed. But the two factors of legibility and speed, working together, and checking each other, have caused, or are causing, medium slant to come to stay, as I think. And this adoption of medium slant must not be considered as a compromise, for compromise suggests a remaining opposition, an unsatisfactory settlement. It is rather to be considered as a resultant of the operating of two factors working in harmony.

In accordance with this principle of harmony of economies, a child should learn to spell well, but his spelling vocabulary should not be extended beyond what a reasonable expenditure of time and energy would give him. When fairly interpreted, the principle holds equally true in all the subjects. And it is coming to be applied in practice, as is shown in the present movement to lessen the number of topics to be treated in the different subjects, and in this and other ways to cut down the amount of time to be devoted in case of most of the subjects.

The present movement for a scientific study of economy in school education is basic in our attempt to solve the problem of the school. The purpose of the school is not that the child shall learn, for he would learn without the school. Its purpose is to furnish conditions under which the child, thru systematic and economic effort, will accomplish more for himself, and that what he accomplishes will be of better quality, and that the product will be secured to him in a shorter time and with less expenditure of energy, than if he learned under other conditions.

This problem of economy in school education breaks up, in practical study, into three problems: (1) the development, in so far as is possible, of accurate and usable means of measuring results and processes; (2) the bringing about of the most economic organization, and (3) the problem of method in learning and teaching.

It is becoming clear to us that our problem for first consideration (in order, not in time) is that of developing standards and measuring results. When fully considered much of the ground for the great waste in education is due, I think, to our lack of adequate means for placing reliable estimates on our results and processes; we lack in the matter of a definite, desirable, and reachable goal to be sought thru a given topic, or process, or stage of the work in a given subject. We have been forced to work in a more or less blind, do-and-trust-to-luck sort of way. I need not enumerate the investigations that show how unreliable we have been in grading children's work. A single test will suffice to remind you. A year ago, in coöperation with Superintendent Smith, of the Bloomington schools, we had sixty-seven upper-grade pupils read the first chapter of Moores's *Abraham Lincoln.* Twenty-four hours later each pupil was asked to write from memory the main facts given in the chapter. The children's papers were graded by ten teachers of experience. Tabulation of the result shows variation, in part, as follows:

1. In no instance was there agreement in the markings. The lowest difference between the highest marking and the lowest in sixty-seven papers was 20 percent; the highest difference was 80 percent.
2. The median for the differences between lowest and highest markings in the sixty-seven papers was 45.

The present movement to develop standards for physical and mental tests, and for measuring tendencies, special abilities, and results, is a most significant attempt to meet the conditions that I have recalled to your minds. Sufficient progress has been made to guarantee great improvement to come. Yet I doubt if any one has more than a mere glimpse of the great progress that will be made in this line within the next forty or fifty years.

The beginning of this movement in Indiana is very encouraging. The sympathetic way in which the school men and women of the State have taken hold of the work while it is still in the experimental stage is highly commendable. I have heard just two objections given against the setting up of standards for measurement. One is that the test is objective, not subjective. This objection I have heard from three or four school men in Indiana altho one should not feel surprised or discouraged if it were widely urged at the present stage. The other is, that it will result in an attempt to develop all children alike; to run all thru the same mold, with the same outcome of product. I have heard this objection urged by a very few school men. The encouraging thing is that the great mass of educators in the State are approaching the question actively and open-mindedly. I know this to be true by the excellent response we are receiving here in the School of Education in the matter of coöperative research.

Without going into argument, I may refer again very briefly to the two objections mentioned. First, in regard to the objective character of the tests now being used and further developed. That is just their claim to value; they are definite and tangible measures of definite and tangible results. The measuring unit must be as definite, as accurate, as objective as the result. The only way in which we can measure a man is thru what he does. That is the only way a man can really measure himself.

I grant that we cannot subject all of human life to mathematically accurate tests; certainly not in the near future. I agree, too, that human life is deeper than all our mathematics. Nevertheless, man's life is full of mathematics. He was mathematical before he became very spiritual. His mathematical self made the higher spiritual self possible. Just so this accuracy in objective terms will lead us to a clearer and more definite estimate of any classes of results which we may not be able to subject to definite objective standards.

As to the tendency to seek uniform results, the effect is meant to be, and is proving to be, just the opposite of uniform. Our surveys are giving us a knowledge of the conditions, both in school and out of school, under which the individual child lives. Physical and mental tests will tell us more accurately than we have been able to know heretofore the ability of each individual. The classroom tests will show us still more definitely the actual results and possibility of the individual child. With this accurate knowledge of the ability of the individual child, there is no way open but to make his self-furnished standards the guide in his case.

The principle of economy when applied to the individual child presents the second problem I have mentioned—that of organization of the school itself. The method of solution is simple. The principle is that the organization must be such that *each child shall have opportunity for being at his best all the time in all the subjects.* The school by this principle must be organized, in so far as possible, to permit *individual promotion by subjects.*

The problem of organization of subject-matter into the course of study is more difficult on account of the difficulty in securing agreement in determining educational values, and in selecting material. Yet good progress is being made. We must find some way by which we can, in general, reduce the time devoted to the different subjects. This can be done as rapidly as we come to see (1) that a child need not recite in class, or learn in school, all the facts that he will need to use in later life, and (2) that a subject can usually be organized about a very few principles and organically related topics.

The greatest progress will come, in my judgment, with our advance in our knowledge of method, using the term method in the sense of mental movement. So far we have relied mainly on imitation and trial-and-error. Both are good, but not sufficiently economic. We must find, much more accurately than we now know, how children learn; the nature of the process and the conditions most favorable for the process. We already know a few general principles sufficiently well for use in experimental work. Our problem in method has therefore reached the state, as it seems to me, of experiment under guidance of psychological principles.

If we set up a certain standard based upon what certain groups of children can do, that standard is open to question from the points of view of economy, organization, and method. Because of the inter-relation of these different factors in determining efficiency, such questions as the following arise: Does the standard demand too much or too little in time and energy? Could the individual, under different organization and method, meet the requirement of the standard more economically? Could he, under a different method, raise the standard with the same expenditure of time and energy? Is it desirable to raise the standard? Is the method such that the pupil has developed a sufficient degree of ability in applying the knowledge indicated by the standard? To what extent does the particular standard indicate future ability of the individual who has met it? In like manner definite standards are required in determining and checking the applications of the principles of method.

The three problems of standard tests, organization, and method are organically related. It would be a great error to attempt to solve any one of the problems independently of the others. Each must suggest the other two, and each must serve to check and guide the others.

These problems cannot be best handled individually. It is not a matter for the man in the School of Education to solve in his study of classroom, or the superintendent or supervisor in his office. The further work on principles must be done thru practical application. The schools of education need the coöperation of the public schools, and just as much, I think, the public schools need the coöperation of the schools of education. This reciprocal value I need not discuss here, as it will be taken up in a later discussion of the conference.

I may say in closing that this conference, with the single set purpose of the members, gives us all the encouragement in the way of coöperative spirit that men in schools of education could ask. We are glad to welcome you!

MR. GREATHOUSE: It will be necessary, ladies and gentlemen, to change the order of the program from the one printed. We have just had a telephone message from Mr. Courtis saying that he has missed his train at Indianapolis and it is impossible for him to reach Bloomington before the afternoon session; so it will be necessary to take up part of the afternoon work at this time. I am pleased to announce the subject on the program for 3:30 this afternoon, as a Symposium on Coöperative Research. Superintendent O. C. Pratt of the Wabash public schools will now speak to you on "The Value of Coöperative Research".

THE VALUE OF COÖPERATIVE RESEARCH.

MR. PRATT: In arranging to discuss the value of coöperative research from the superintendent's point of view, Superintendent Stopher and I did a little coöperative planning. It was decided that I should introduce the subject in a general way, limiting myself to impressions gathered from coöperative work, while he would discuss in detail the results of one such study.

In an article under the caption, "A Fairyland of Science", in the February number of the *National Geographic Magazine,* I ran across a sentence which seems to me to be very pertinent for the purpose we have in view in this conference. The sentence reads as follows: "Just as James Watt could not make a steam engine until men were able to take measurements so exact that a cylinder and a piston could be built which were steam-tight and yet allowed free play, so the perfect automobile of today had to wait until men could measure the five-thousandth part of an inch, and the perfect ship's chronometer until they could measure distance five times more minute than that." For every expert worker, whether of hand or brain, a certain degree of accuracy in measurement is indispensable. I once knew a carpenter whose work was seldom satisfactory because he seemed to realize the existence of only one unit of measure less in length than the inch. If "Uncle Dick", as we called him, had to measure a board to fit an opening, he usually announced the needed length as so many inches and a "smidgin" over. Uncle Dick was an honest, sober, industrious workman, but he was largely a failure as a carpenter because his unit of measure, the "smidgin", lacked that degree of accuracy essential to successful work in his chosen trade.

It seems to me that the source of Uncle Dick's weakness as a carpenter is also the source of much of our weakness as teachers. We, too, measure entirely too freely by "smidgins", and because we are working with products less tangible than door frames, we are all too often unaware of the extent to which our work fails to fit.

Herein appears the value of the new educational scales and of coöperative research. One of the things brought out most prominently by the educational scales is the extreme range of variations among pupils of the same grade in any line of work. The scales also make clear that the work of teachers is equally variable. Superintendents commonly classify teachers as "superior", "strong", "fair", etc. As a matter of fact, there are few if any teachers who are uniformly strong in teaching the various subjects of the curriculum. Some years ago I had each of the teachers then under my supervision indicate the subject which she liked best to teach and that which she liked least. I then had her average the grades which she had given her pupils in their various studies for the year, and with scarcely an exception the teachers were surprised to find that they were teaching best what they liked best, and worst what they liked least.

There is every reason to believe that superintendents are as variable in the strength of their work as are pupils and teachers. The teachers in a school system soon detect the superintendent's hobby, and whether consciously or not, will consider important what he most emphasizes. Coöperative research enables the superintendent to get a line on his school system which will reveal the directions in which it is strong and those in which it is weak. It enables him to substitute a certain degree of scientific precision and accuracy in viewing the school system which he supervises in place of the more or less hazy, indefinite impressions, the guesswork "smidgins", to which he is otherwise limited.

Coöperative research, by pointing out the weak places in a system of schools, shows the teachers and superintendent the proper point of attack. It discloses certain problems of abnormality and asymmetry, the very existence of which was previously unknown to the school authorities. It undoubtedly raises problems of all kinds, tho solutions for them may not be forthcoming.

Coöperative research arouses in the entire teaching corps a deeper interest in education as a profession and a stronger incentive to look at school work in a professional manner. Most of us here, I presume, have at one time or another taken correspondence courses. Such courses are more difficult than those pursued under classroom instruction chiefly because the incentive toward effort which one gets from association with his fellows in the classroom is lacking in correspondence work. One is thrown upon his own resources and must work alone. Without coöperative research the teacher is similarly isolated. She has no sure means at hand for judging in detail the quality of her work. Those who supervise her work are more or less noncommittal, partly because their opinions are not definite and clearcut, and partly because, being mere opinions, they cannot be substantiated by conclusive proof. Coöperative research offers impartial and impersonal evidence which cannot be gainsaid. If the superintendent finds his previous opinion confirmed, he can then confer with the teacher with more confidence that his views are sound. If the teacher finds a weakness in some unsuspected place, the greater attention which she will give that phase of her work will tend to cure the defect without specific comment by the superintendent. If both superintendent and teacher find their school system distinctly below the general level in any respect, they set themselves whole-heartedly to the task of bringing it up to grade.

The educational scales in conjunction with coöperative research give a better opportunity to mark progress made. This in itself furnishes one of the strongest possible incentives for energetic work. We all like to see the chips fly. Every one likes to have assurance that extra energy expended will bring measurable results in extra progress made. One of the greatest drawbacks to teaching as a profession has been our inability to measure the results of our teaching. To the average school patron, teachers are like what the Irishman said of men, "One is just as good as another", except that the Irishman added, "if not better". We are even yet unable to discriminate sufficiently in favor of the better teachers. Evidence of this fact may be found in the too nearly uniform success grades which we give our teachers. Probably nine-tenths of the city teachers in Indiana are rated at or above ninety percent in success. In view of this, is it at all likely that we are measuring our teachers accurately or fairly?

Coöperative research benefits the pupil by enabling him to compete not so much with his stronger or weaker fellows as with himself. It gives him and his parents a definite measure of his progress, and an accurate notion of his relative class standing in the particular phase of the subject measured. That the scales we now have are imperfect none will deny. That no scales yet devised will measure any school subject from every angle is undoubtedly true. But it is equally certain that the gain in accuracy of measurement will eventually bring about such a reconstruction of educational machinery that we may ultimately hope to attain to a perfection approaching that of the automobile engine, or the ship's chronometer.

MR. GREATHOUSE: The subject will be further discussed by Superintendent E. C. Stopher, of the Noblesville city schools.

A CONCRETE CASE OF COÖPERATIVE RESEARCH

MR. STOPHER: Ladies and gentlemen, my particular task is to discuss in a very brief way a concrete case of coöperative research and give the benefits of that particular research to our teachers.

During the year 1911-12, the Northern Indiana Superintendents' Club made a study of retardation in the schools which they represented. In particular the report was for the first semester of that year. Each superintendent embodied in his report the total enrollment, an age-grade distribution of children for the eight grades, the total failures, percent of failures, a brief study of the causes of the failures, and the main subjects in which the pupils failed. Superintendent Deamer of Laporte organized and tabulated the results from the various schools.

The percent of failures for this term ranged from 6.1 percent of all pupils in one city to 20.6 percent of all in another, or from 5 percent of the girls in one place to 22.7 percent of the boys in another. In each of the fifteen cities studied, the percent of failures among the boys was larger than that among the girls. The chief subjects in which pupils failed were reading and arithmetic.

This report was followed by another which undertook a more careful and detailed study of the amount of and the causes of retardation. We in Noblesville had not made any accurate measurement of our retardation but believed there was less in Noblesville than in many other towns. We had been strengthened in this belief by visiting other schools and concluding that the pupils in our upper grades appeared younger than those in others. Many of our teachers wished that we might have fewer failures but justified in a way our number because of the belief that we had fewer than others.

This coöperative study was made during the fall of 1912. The causes of retardation were listed as (1) mental defects; (2) physical defects; (3) sickness; (4) truancy; (5) poor home life; (6) late start; (7) laziness; (8) overwork; (9) changes of schools; (10) irregular attendance; (11) poor teaching; (12) timidity; (13) other causes. Superintendent Hines of Crawfordsville did most of the work in organizing and tabulating the results of this investigation.

Ayres' method of determining who were retarded was used and then each teacher was asked to give as best she could the cause of the retardation. If there were in any case several causes the one the teacher considered the most important was assigned. The investigation as to causes was scientific only in that it recorded accurately the best judgment of the teacher.

TABLE I. CAUSES OF RETARDATION IN TWENTY INDIANA CITIES

CAUSES.		City 1.	City 2.	City 3.	City 4.	City 5.	City 6.	City 7.	City 8.	City 9.	City 10.	City 11.	City 12.	City 13.	City 14.	City 15.	City 16.	City 17.	City 18.	City 19.	City 20.	Totals.	Percent of Enrollment
Mentally defective	Boys	3	38	11	17	0	19	16	50	13	12	8	3	11	6	36	7	13	10	14	15	302 } 540	2.3
	Girls	5	36	11	14	1	17	8	32	7	8	9	0	5	4	23	11	23	4	5	15	238	
Physically defective	Boys	7	17	17	5	4	9	12	17	12	5	5	1	11	5	5	8	7	1	3	6	157 } 284	1.2
	Girls	6	11	20	6	2	6	3	17	3	5	3	2	7	7	0	9	14	1	0	5	127	
Sickness	Boys	13	32	6	7	2	16	7	15	3	7	12	11	8	5	10	6	2	2	1	2	167 } 320	1.3
	Girls	7	28	4	10	1	10	2	18	8	5	8	11	7	9	7	6	4	3	3	2	153	
Truancy	Boys	0	5	5	1	0	1	0	5	1	2	0	0	0	3	1	2	1	0	1	0	28 } 36	.15
	Girls	0	0	2	1	0	0	0	1	0	0	0	0	0	3	1	0	0	0	0	0	8	
Poor home life	Boys	8	28	7	8	10	24	17	12	16	17	13	5	5	15	10	12	8	3	9	7	234 } 384	1.6
	Girls	9	115	1	10	3	12	5	9	5	13	10	0	0	15	5	15	7	3	7	6	150	
Late start	Boys	5	12	4	7	0	10	1	21	1	4	0	0	42	12	2	2	2	2	2	0	129 } 245	1.
	Girls	3	14	5	7	0	7	0	21	1	5	2	1	23	11	5	4	1	2	3	1	116	
Laziness	Boys	3	30	6	4	5	22	10	31	21	26	47	8	15	6	6	12	4	2	13	2	273 } 342	1.4
	Girls	3	8	6	0	1	3	1	3	2	3	16	8	5	2	3	0	3	0	0	2	69	
Overworked	Boys	0	0	5	0	0	2	1	0	0	1	0	0	0	1	0	0	0	0	1	0	11 } 24	.1
	Girls	0	0	5	0	0	1	0	0	0	2	0	0	0	5	0	0	0	0	0	0	13	
Change of schools	Boys	5	27	2	8	4	15	7	28	24	15	14	1	56	7	12	8	0	4	3	7	247 } 438	1.8
	Girls	13	26	2	8	3	11	6	22	10	9	13	1	34	8	5	7	0	3	3	7	191	
Irregular attendance	Boys	3	20	5	5	0	10	4	34	0	7	2	12	17	11	4	4	6	2	7	2	155 } 280	1.1
	Girls	3	19	2	3	0	10	0	23	0	10	2	4	14	6	7	8	5	0	8	1	125	
Poor teaching	Boys	0	1	1	1	0	1	5	1	0	1	0	1	0	1	1	1	0	0	0	0	15 } 24	.1
	Girls	0	0	1	0	0	1	0	1	0	0	0	1	1	2	2	0	0	0	0	0	9	
Timidity	Boys	2	1	0	1	0	3	3	0	0	0	0	0	2	1	3	1	0	0	2	1	20 } 55	.2
	Girls	1	4	0	3	1	2	1	0	0	2	0	0	0	7	3	4	0	1	4	2	35	
Other causes	Boys	11	8	10	2	4	12	5	124	0	11	0	15	33	8	0	4	8	0	6	0	261 } 451	2.
	Girls	10	9	11	0	0	3	0	98	3	14	0	6	15	4	0	4	12	0	1	0	190	
Total retarded	Boys	60	219	79	66	29	144	88	338	91	108	101	57	200	81	90	67	51	26	62	42	1999	......
	Girls	60	170	70	62	12	83	26	245	39	76	63	34	111	83	61	68	69	17	34	41	1424	......
	Total	120	389	149	128	41	227	114	583	130	184	164	91	311	164	151	135	120	43	96	83	3423	......
Total enrollment		650	3566	763	870	475	1308	707	2379	1530	1053	652	1242	2013	1176	759	575	1190	591	1361	694	23,253	......
Percent of children retarded		18.5	10.9	19.5	14.7	8.6	17.3	16.1	24.5	8.5	17.5	25.1	7.3	15.4	14.	19.9	23.5	10.1	7.3-	7.	12.	14.7	......
Rank of school system		15	7	16	10	5	13	12	19	4	14	20	3	11	9	17	18	6	2	1	8	....	......

2—3150

The accompanying table (Table I) shows the result of the investigation. Twenty schools were studied and the numbers at the top refer to these different schools. They were Alexandria, Anderson, Auburn, Bluffton, Columbia City, Crawfordsville, Decatur, East Chicago, Frankfort, Hartford City, Kendallville, Laporte, Michigan City, Mount Vernon, Noblesville, Plymouth, Princeton, Rochester, Wabash, and Warsaw. Noblesville was number 15. The total number of pupils in these schools was 23,253; the number retarded was a little more than 3,400, of whom practically 2,000 were boys and 1,400 were girls. It could easily be seen that the number of girls retarded was only about two-thirds of the number of boys. In Noblesville there were 61 girls and 90 boys, a total of 151, who were in most cases two or more years too old for their grades.

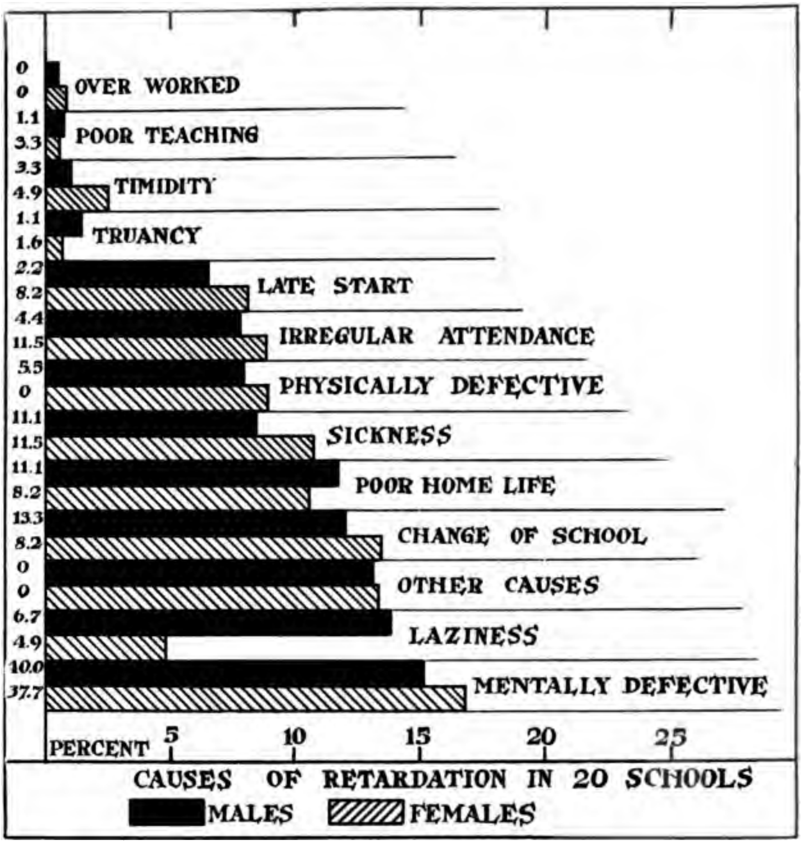

FIG 1. CAUSES OF RETARDATION IN TWENTY INDIANA CITIES, 1911-12

The percent of retardation ranged from Wabash with 7 percent to one of the schools with 25.1 percent. Noblesville stood number 17 with 19.8 percent.

The column marked "Totals" indicates the number of boys and girls retarded for the various causes. Thus we find that 302 boys and 238 girls were said to be mentally defective; 157 boys and 127 girls physically defective. The ratio of boys and girls changes for the various causes. More than three times as many boys as girls were said to be retarded because of truancy and laziness, while in only two cases were there more girls than boys,—those retarded because of overwork and those because of timidity. The percent of retardation for each city is indicated on the chart and the rank of each system among the twenty is shown on the bottom line of the chart.

Figure 1 shows more plainly the comparative number of boys and girls retarded for the various causes.

The percent of the total number of boys retarded because of overwork is indicated by the length of the solid line, 0.5 percent; the percent of girls retarded for this reason was .9 percent and is indicated by the length of the crossed line. The causes are arranged in order of the percent of the boys retarded. It is interesting to note that "laziness" is assigned as the cause of failure among boys nearly three times as often as among the girls. It should be borne in mind that these causes were the estimates of the teachers and not determined by any kind of test.

Altho there were more boys than girls retarded for nearly every cause, yet it was seen that only in three causes, namely, truancy, poor home life, and laziness, was the percent of boys retarded larger than that of the girls. With the exception of "poor home life" these were causes over which the child could exercise some control. There were eight causes in which the percent of girls retarded was larger than that of the boys, and these were causes over which the child had little or no control.

Now of what value to Noblesville teachers was this particular coöperative study? In the first place it indicated definitely that there was actually a large amount of retardation because we stood number 17 in a group of 20. Some definite information as to the actual conditions was now available and definite information as to conditions is essential to improvement. Of course the fact that we stood so near the top or bottom was not conclusive proof that conditions were not what they should be, but in this case teachers without exception interpreted the figures to mean that in some way we must reduce the waste caused by retardation and move considerably closer to Wabash. In the second place, then, *this research work did more than years of study and theorizing to make each teacher realize the importance of the question, enter heartily into further study of it, and endeavor to make improvement.*

The fact that Noblesville would in all probability at some future period again be measured along with other schools gave enthusiasm to the work at hand.

TABLE II. RETARDED CHILDREN IN THE NOBLESVILLE SCHOOLS

GRADE.	Total Enrollment by Grades.			Percent of Children Retarded.			Rank of Grade in Retardation.		
	1912	1913	1914	1912	1913	1914	1912	1913	1914
First	131	131	122	12.2	13.7	3.3	2	2	1
Second	98	113	108	17.3	11.5	15.7	3	1	3
Third	88	99	117	21.6	15.1	15.4	4	3	2
Fourth	118	94	98	28.8	21.3	16.3	7	4	4
Fifth	94	101	85	31.9	26.7	22.4	8	8	6
Sixth	76	91	100	23.7	26.4	29.0	6	7	8
Seventh	75	86	90	22.7	25.6	24.4	5	6	7
Eighth	80	61	82	10.0	21.3	19.5	1	5	5
Total	760	776	802	21.2	19.6	17.6	....	....	....

A study of the causes assigned for retardation encouraged a number of teachers to be more actively interested in child study. Were boys so much lazier than girls? Was this characteristic prominent in other lines of activity? Why did girls seem to adapt themselves more readily to the routine of the school? How may the teacher make the school work appeal to the boy who is apparently lazy? What may the teacher do to eliminate a number of the causes of failure? Of what value is it to a mentally deficient child to repeat a grade? These were some of the questions asked and the fact that other schools were interested in these same problems was an incentive to careful study and action.

The doubts raised in the minds of the teachers as to the legitimacy of some of the causes assigned for failures has aroused more interest in the individual child. This has caused a decrease in the number of failures and, I believe, has at the same time resulted in a lower percent of variability in the different classes.

In summing up the results of this research work, the following facts may be given:

1. Definite information was secured concerning the relative standing of our school among nineteen others, the first thing necessary for improvement.

2. The problem was brought home to teachers and made real to them more definitely than could have been possible in any other way.

3. The knowledge that others were interested in the same problem aroused interest and enthusiasm, and seemed to give dignity to the question.

4. Teachers took a more professional attitude toward the question of retardation.

5. Teachers became more interested in child study, in the subject of individual differences, and in the welfare of each individual child.

6. Teachers concluded that since there were so many more failures among the boys than the girls, our course of study was probably like that of a number of others better adapted to the abilities of girls than to those of boys.

7. The benefit to the teacher can best be measured by noting the results of the investigation. Table II shows the enrollment in each grade for the years 1912, 1913, and 1914, the percent of retardation, and the rank of each grade. Thus we may see that the total retardation has decreased to 17.6 percent, and whereas in 1912 the most retardation was in the 4th and 5th grade, now it is in the 6th and 7th. This is as it should be and is perhaps the best indication of the value of the investigation.

MR. GREATHOUSE: M. E. Haggerty, Associate Professor of Psychology here at the University, will give the closing address on this topic.

COÖPERATIVE RESEARCH FROM THE VIEWPOINT OF THE UNIVERSITY

MR. HAGGERTY: It is my purpose to discuss the matter of coöperative research from the viewpoint of the University. In doing so I shall confine myself chiefly to that aspect of our program with which I personally am most concerned. I hope the spirit of my remarks will represent the interests of other members of the faculty who are interested in other phases of this matter.

In the present contact of the science of psychology with education, interest centers about two problems, the measurement of mental ability as an individual quality and the measurement of school products. In both fields the most striking achievement has been the establishment of standard norms with which individual measurement can be compared. For the measurement of mental ability we have the Binet scale with its various revisions and extensions. For the measurement of school achievement we have the Thorndike, Ayres, and Freeman scales for handwriting, the Buckingham spelling scale, the Thorndike and Courtis scales for reading, the Courtis, Hillegas, and Harvard-Newton scales for English composition, the Courtis standard tests for fundamentals in arithmetic, and others not so well known as these. Both in the measurement of general mental ability and the measurement of school products there is evident a vigorous tendency to press on from the first crude and tentative standards to more refined and accurate means of measurement. Binet twice revised his own scale, Goddard revised it in 1911, and we are now about to have the Stanford Revision, the work of Terman and his students, and Yerkes and Bridges have in press a book describing a "point scale" method which, it is thought, will be a great improvement over any previous scale. It is quite improbable that we shall have reached the end with the publications of these scales. Better adapted tests, more accurate methods of grading, more clearly defined norms are the goals toward which we are moving.

The same movement is apparent in the standards of school achievement. From the first handwriting scale of Thorndike, crude and tentative as its author admits it to be, we have a succession of steps to new subjects and to revisions of the earlier scales. Work is only well begun in this field. The next decade is certain to see a very wide-spread interest among students of education in standard tests and they will be widely used by school men.

The significant thing about these standard tests and standard norms of achievement is that they have given us for the first time in the history of education one of the indispensable instruments of scientific study. They provide us with a dependable objective instrument for measuring the results of educational procedure.

One can realize the importance of this best by thinking what similar instruments have done for other sciences. There was doubtless a time when there were no standard measures of any sort. There was no science then, neither was there any mechanical or ornamental art, nor any stable and general commerce. Many of the words which still serve to designate legal units of quantity bear witness to a commonplace origin. Foot, pace, pound, fathom, grain, yard, are some of these. Doubtless all of these measures of length at first were subject to great variability in actual use, a variability as great as we experience in the use of the Thorndike writing scale, greater than we get with the Courtis tests in arithmetic. It has taken a very long time to refine these units and to develop others as the need for them has arisen. Today many of these standards are legalized units in all civilized countries, and both commerce and science are dependent thereon. Our own government maintains a Bureau of Standards at Washington with exact standard units for all measures of mass, length, and time, with a large number of derived units.

For all current work in physical science these standard units are essential and without them modern physics or modern chemistry could not exist. Every student in these sciences must learn about them. Every new discovery or invention in science must be stated in terms of them; and every physical and commercial enterprise of modern civilization is absolutely dependent upon them. It is not surprising that a physicist, with his highly refined instrument of physical measurement, should look doubtfully upon the, as yet, immature efforts at measuring mental qualities and mental achievement.

What has already been done for physical science and to a lesser degree for biological science must be done to some degree for psychology, sociology, and economics if education is to achieve a standing alongside medicine and engineering as a program of scientific endeavor. We are yet a long way behind these older applications of science, but it means a great deal to our future that students of education and school men are becoming sensitive to the fundamental scientific need of standards of measurement.

One of the first things which the establishment of standard norms will do for the science of education will be to make definite and specific the aims of teaching. We have a bountiful supply of general aims, all of which have greater or less value. Education is to prepare for life; it is to train for citizenship; it is to make cultured men; it is to prepare for vocations; it is to develop power; it is to teach children to read and write. It is easy to agree with such aims, but they are of limited value to a teacher in the concrete tasks of the schoolroom. Where one confronts a particular boy with a particular task, like adding ten-figure columns, such aims as life, citizenship, culture, and power seem remote and ineffectual. It is safe to say no teacher really thinks of them. What one does think of is the particular boy and the particular problem and the time being spent and the quality of the work being done. But in these concrete matters one is greatly handicapped because just what a twelve-year-old boy in the seventh grade should do in ten-figure column addition has been until recently very much a matter of opinion, and usually of conflicting opinion. All would agree that a boy at twelve should add better than at ten, but until recently we have had no definite objective standards as to what he should do at any age. In the absence of such a definite objective standard we have had all sorts of individual standards. Teachers in the same school, with similar children under similar conditions, have expected different achievement; at times standards have been established for a school and even for a city. With the progress of standards we shall be able to know what the average child at any age should do, what the best child will do, what the poorest child will do, and what percent of children will be able to make a particular score.

By the use of the Courtis standard tests in Indiana cities last year, we were able to show the median achievements of nearly nine thousand children. It was possible to determine a standard for each of four grades. The median scores for the several grades were as follows:

TABLE III. MEDIAN SCORES IN ARITHMETIC IN TWENTY INDIANA CITIES[1]

GRADE	Addition		Subtraction		Multiplication		Division	
	At.	R.	At.	R.	At.	R.	At.	R.
Grade 5	6.6	3.6	7.3	5.0	6.3	3.9	4.5	2.6
Grade 6	7.4	4.4	8.9	6.5	7.6	5.1	5.7	4.8
Grade 7	8.0	5.0	10.1	7.8	8.6	5.9	8.5	6.7
Grade 8	9.0	5.8	11.2	8.9	10.2	7.3	10.6	9.0

[1] *Indiana University Studies*, No. 27, "Arithmetic: A Coöperative Study in Educational Measurements." By M. E. Haggerty.

These facts are represented on a set of charts which I will show you here. This particular chart (Fig. 2) is called the Indiana Standard.

In this figure the individual medians of the 8,712 children reported by the twenty cities are represented by short horizontal lines across the sheet so drawn as to appear at midsection of the vertical dimension. This line is called the Indiana Standard. Each vertical line represents the scale for the test in question. The first, third, fifth, etc., lines represent the number of problems attempted in the several tests in the several grades. The second, fourth, sixth, etc., lines in a corresponding manner scale the examples right. The portion of each line below the Indiana Standard is proportional to the difference between the zero and the median score. It is accordingly scaled into the proportional number of parts. The part of the line above the Indiana Standard is similarly scaled. Each vertical line is therefore a different scale from every other vertical line, since the median is different in every case.

It is possible on this form to graph the results from a class, school, or city, and to see quickly its relative standing. To do this you locate the proper score on its appropriate vertical line. If you join the points so located on the attempts scaled by a solid line with the similar point on the rights scale, you have represented the dependability of the work. If the line so drawn is parallel to the Indiana Standard, the percent of dependability is the same as the Indiana Standard. If the line slants upward to the right, the dependability is greater; if the line slants downward to the right, the dependability is less.

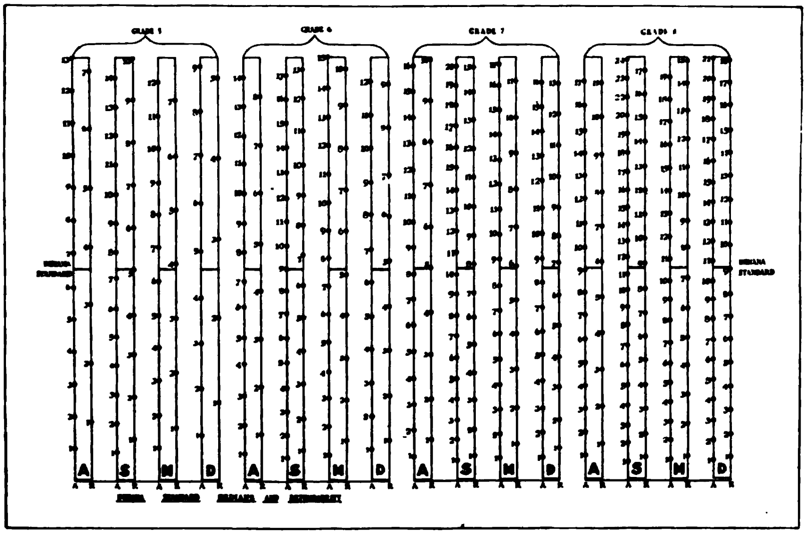

FIG. 2. INDIANA STANDARD: MEDIANS AND DEPENDABILITY IN ARITHMETIC

You may take exception to saying that what the average of nine thousand children do in Indiana should be called the Indiana Standard. Possibly it is not a very good name. Possibly it would have been better, for instance, if instead of taking the average of

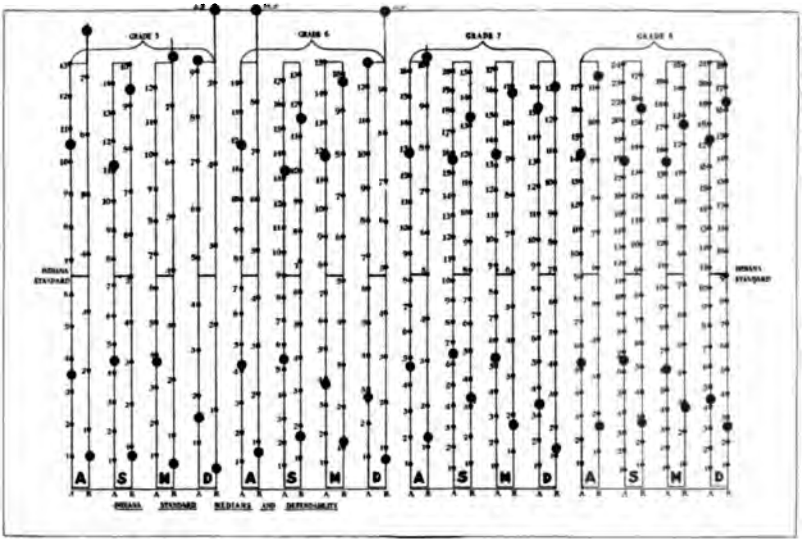

FIG. 3. MEDIAN SCORES OF BEST AND POOREST TEN PERCENTS IN ARITHMETIC OF 8,712 INDIANA CHILDREN

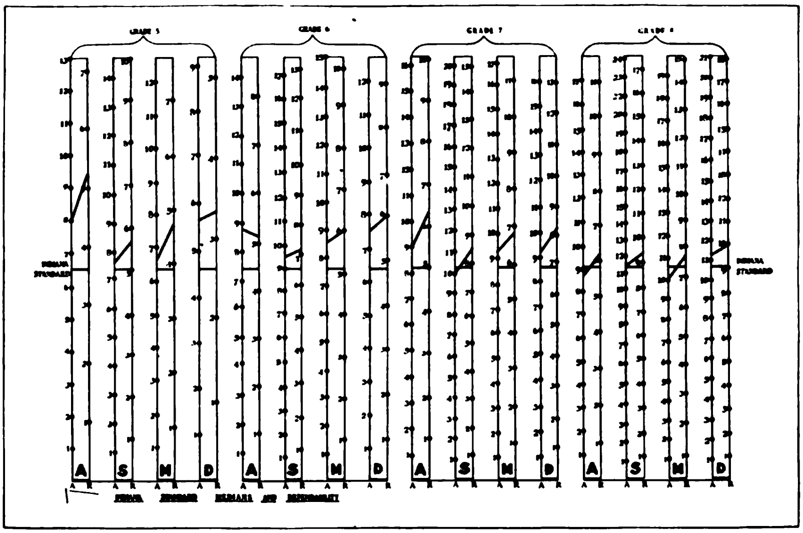

FIG. 4. MEDIAN SCORES IN ARITHMETIC IN ANDERSON (IND.) PUBLIC SCHOOLS (MAY, 1914)

these nine thousand children as the Indiana Standard we should have taken the best ten percent, the ones represented by the large dots at the top of this chart (Fig. 3).

These stand very much above the median of the whole group. The dots placed near the bottom indicate the medians for the poorest ten percent of the nine thousand children. It makes a very interesting picture. Here you see and realize that in the same grade you have ten percent of the children who make the score represented by the large dots near the bottom of Figure 3 (indicating), and you have another ten percent of children who make the score represented by the large dots near the top of Figure 3.

I will show you what you can do with this chart,—one thing you can do with it, at any rate. Figure 4 represents the results from the Anderson public schools,[2] more than a thousand children in the four upper grades. The median scores are graphed in relation to the Indiana average. If Anderson had been just the average city its lines would have fallen exactly at the points marked by the horizontal lines. You see Anderson did better than the average in fifth-grade addition attempts, and did very much better than the average in fifth-grade addition rights. The direction of these lines is significant all the way across. If a line is parallel to the Indiana median, the dependability, that is, the relation between the problems attempted and the problems accurately solved, is the same as the Indiana average. If the line slants upward the dependability is greater than the Indiana average. If it slants downward the dependability is less than the Indiana average. So that any city can by the use of the chart be very readily placed. You can very quickly tell whether it is better or worse, or just alike.

This chart (Fig. 5) represents the Bloomington[3] returns for last year. In fifth-grade division, you see a very marked superiority, but at some points it is not so marked. There is one case where the dependability is just the same; there are other cases where it is less; so that you get a check on both the median score and on the dependability of the work.

Figure 6 represents the facts in a similar way for the Courtis general scale, the one announced in February, 1914.

Figure 7 represents the same facts for the Boston schools.

Figure 8 represents the facts for the Detroit schools.

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[2] *Indiana University Studies*, No. 27.

[3] *Indiana University Studies*, No. 27.

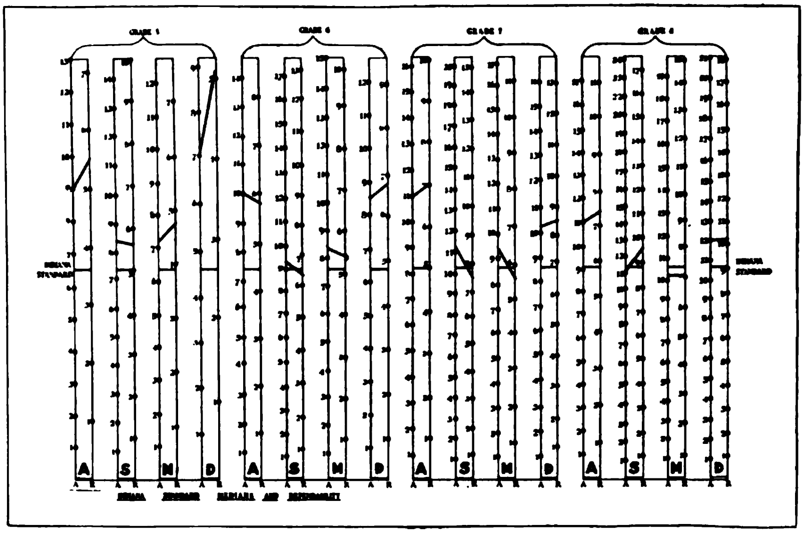

FIG. 5. MEDIAN SCORES IN ARITHMETIC IN BLOOMINGTON (IND.) PUBLIC SCHOOLS (MAY, 1914)

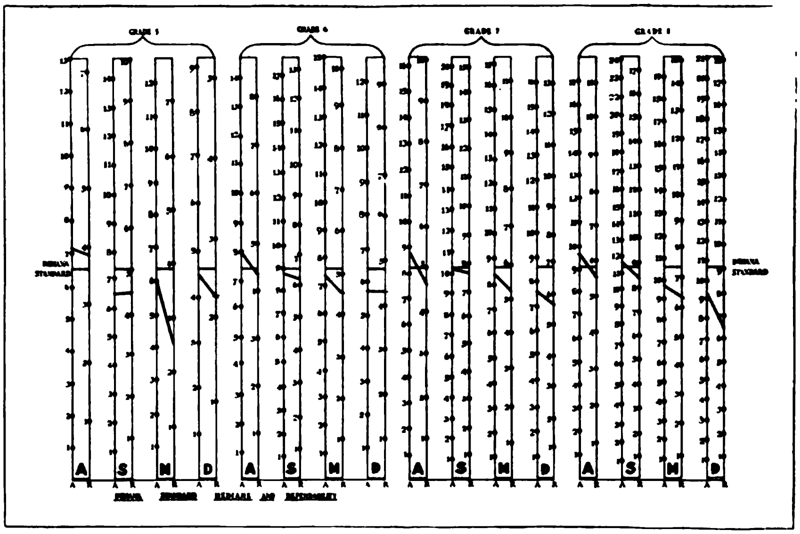

FIG. 6. MEDIAN SCORES IN ARITHMETIC: COURTIS GENERAL SCORE (FEB., 1914)

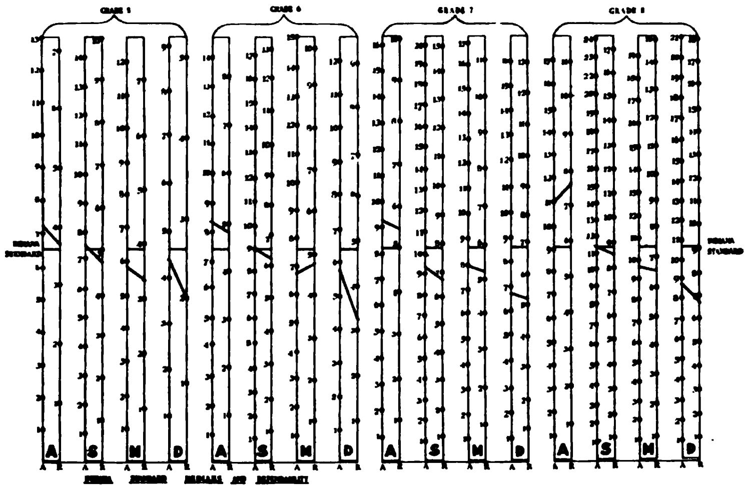

FIG. 7. MEDIAN SCORES IN ARITHMETIC IN BOSTON PUBLIC SCHOOLS (FEB., 1914)

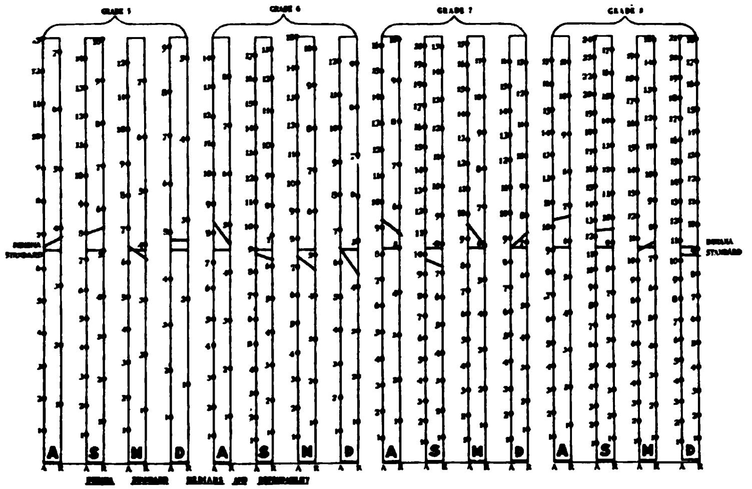

FIG. 8. MEDIAN SCORES IN ARITHMETIC IN DETROIT PUBLIC SCHOOLS (FEB., 1914)

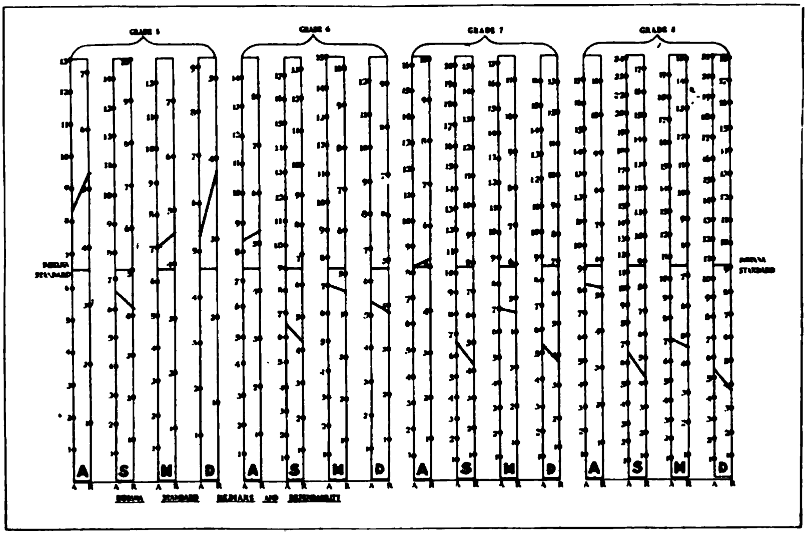

FIG. 9. MEDIAN SCORES IN ARITHMETIC MADE BY A GROUP OF FACTORY WORKMEN IN INDIANAPOLIS (WAGES 20 CENTS PER HOUR)

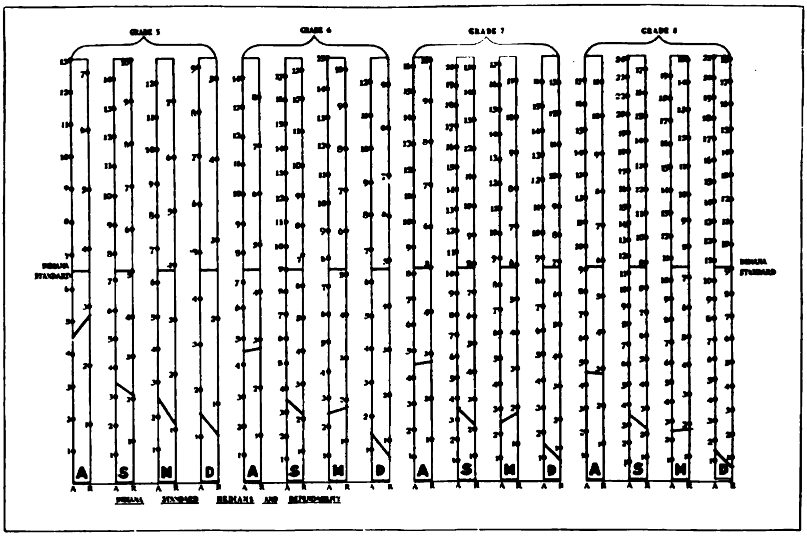

FIG. 10. MEDIAN SCORES IN ARITHMETIC MADE BY A GROUP OF FACTORY WORKMEN IN INDIANAPOLIS (WAGES 17½ CENTS PER HOUR)

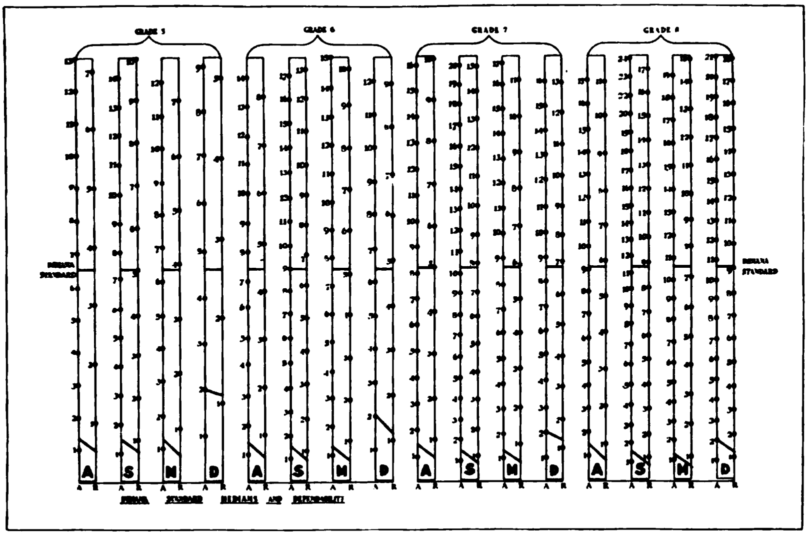

FIG. 11. MEDIAN SCORES IN ARITHMETIC MADE BY A GROUP OF FACTORY WORKMEN IN INDIANAPOLIS (WAGES 15 CENTS PER HOUR)

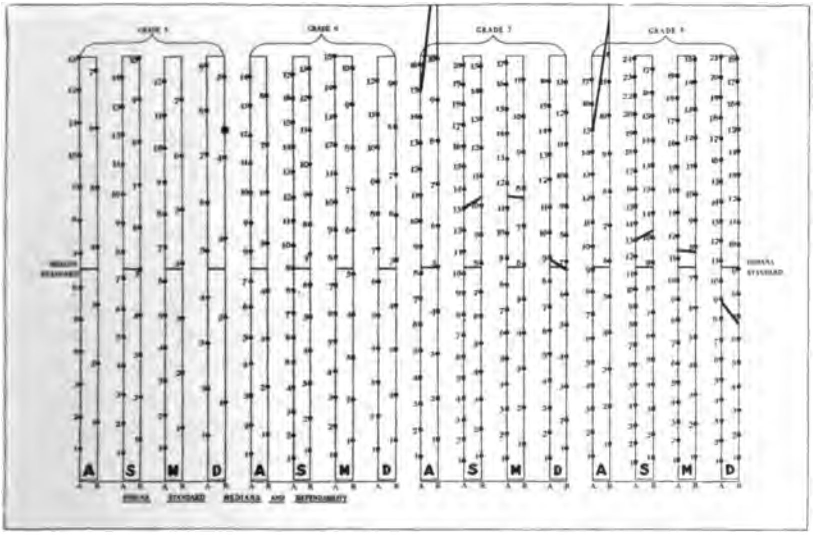

FIG. 12. MEDIAN SCORES IN ARITHMETIC MADE BY A GROUP OF SALESWOMEN IN AN INDIANAPOLIS DEPARTMENT STORE (JAN., 1915)

In the Boston schools there were twenty thousand children considered, and in the Detroit schools between a thousand and fifteen hundred.

Here is a group of charts which represent work which Miss Baylor has been doing in Indianapolis in connection with the workmen in certain commercial and industrial establishments.

This (Fig. 9) is the best paid group of workmen in a certain factory in Indianapolis, and we have charted the results on the fifth-grade scale, the sixth-, the seventh-, and the eighth-grade scales. If you compare them with the fifth-grade scores in addition they are better than the Indiana average; if you compare them with the eighth-grade score they are poorer in the average work attempted, but their dependability is just the same.

This group of workmen (Fig. 10) is paid less money. These two groups are interesting when considered together. Twenty cents an hour was the average of group "A", and seventeen and a half cents was the average of the second group.

This (Fig. 11) is the third group of workmen. They attempted less, but their dependability shows somewhat better.

This (Fig. 12) is a group of saleswomen in one of the department stores in Indianapolis. We graphed the results on the seventh-grade standard, also on the eighth. Here you see what happens to people who keep practicing in any one of these functions. The addition work is superior to the average of the seventh grade. These people are busy, are selling goods every day, and counting up small amounts of money. The average is better than that of the eighth grade in the Indiana schools, both in amount and in dependability; but when it comes to matters of division, you see the score is very much poorer.

Standards must be set not only for addition, but for all other topics in arithmetic and for every other subject to be taught. The big aims which catch our imagination and inspire us to do something must be supplemented with a thousand subsidiary aims which show us specifically what to do. These minor aims must be definite, and determined not by individual opinion, but by approved scientific methods. That in committing ourselves to this program we are not following false ideals will be apparent to any one who knows the history of any other science. Chemistry, physics, biology, and psychology have grown by the method of analysis and measurement. So must education. We shall command the respect of scientific men when we use their methods, and teaching will become a real profession to the degree that we develop a specific body of knowledge that teachers must master and use.

Definite standards have a value in educational research in addition to their value in school administration. Like the centimeter, ampere, and gram, an educational unit is the instrument of accurate knowledge about things other than the unit in question. With it, we can determine causes and effects.

All of us are aware that much of educational literature is the expression of opinion rather than the statement of scientifically determined fact, and one reason that illusion and unverified hypotheses have so run riot thru educational discussion has been the absence of accepted standards of measurement. Nobody could disprove anybody else's error.

If we were to ask the two hundred superintendents and principals here present how much time a child should have spent on the subject of reading by the end of the sixth grade, we would get a great variety of replies. Some of these answers would place the time at double the estimate of others, and an even wider range would doubtless be found in the practice of Indiana schools. Superintendent A allots 45,000 minutes; Superintendent B, 100,000. Which is right? The problem is important, for if a boy can learn to read in 45,000 minutes it is waste to have him devote an additional 55,000 minutes to the task. We might get into a heated argument if we should start a discussion on this question, but it would be like disputing with the ice-man about the weight of a cake of ice in the absence of a scale. None could convince another of his error. The case would be much simplified if an objective scale could be applied. The appeal would then be to an impersonal judge. If children spending 45,000 minutes score as high on the scale as do children spending 100,000 minutes, then the 55,000 minutes is sheer waste so far as the ability covered by that scale is concerned. From such a decision there is no appeal except to a more accurate application of a more accurate scale. Mere opinion becomes in such a case just as important as opinion about the law of gravitation, or the rotundity of the earth, namely, of no value at all.

Now any person accustomed to ponder over the problems of teaching can quickly think of a dozen questions to which he would like a definite answer—the problem of oral and silent reading, the problem of phonics, the problem of extensive and intensive reading, the problem of spelling, the problem of transposition, and so on. What does the employment of any one particular method do to the children upon whom it is used? For the solution of such problems as these the employment of standard scales and tests seems necessary. They offer the same effective instrument of research as the meter and the gram offer to the student of physics. It is difficult to see how we can do anything for a science of education without them.

In the use of the Courtis tests last year we worked upon the time allotment in the case of arithmetic. Taking the cities with the highest median scores, we were able to suggest an optimal time for each of the four upper grades. It seemed wisest to suggest an upper and lower limit rather than a single definite number of minutes. This table gives the optimal time.

TABLE IV. OPTIMAL TIME TO BE DEVOTED TO STUDY OF ARITHMETIC FROM BEGINNING OF ITS STUDY TO END OF SEVERAL GRADES, AS DETERMINED BY RANKS 1 AND 2 OF REPORTED SHCOOLS[4]

/ GRADE	Minimum time in minutes	Maximum time in minutes
Fifth	30,000	45,000
Sixth	40,000	55,000
Seventh	45,000	60,000
Eighth	50,000	75,000

Nobody believes this table to be a final statement. Too many causes were at work producing these scores for so simple a solution of the time problem as this would be. It is something to have made the start, however, and we should be able to correct the time standard year by year until it becomes really reliable.

From these fragmentary facts I think you must see that in organizing the Bureau of Coöperative Research[5] we have two definite aims in mind. One is to extend the use of standard tests and other forms of scientific education, and in doing so to serve directly the schools which coöperate. During the current year there will be used in Indiana schools approximately twenty thousand each of the Courtis Arithmetic Tests,—Series B, and the Thorndike Reading Scales. We feel that in forwarding this work we are doing a service to these schools and to their teachers. Our second interest is to collect material, to study it, and to work out in a scientific way whatever facts are indicated by the results of the work. Whenever the material seems of sufficient worth we shall publish it as a University bulletin. The first bulletin to be issued is the one dealing with the results of the Courtis tests which were given last May. This bulletin is now available. Other bulletins will be published within the year. The report of this conference will be published in this series. We shall expect to report on both the Courtis and Thorndike tests of this year, on the age-grade table of the first eight grades, and on the conditions and causes of elimination and failure in high schools. Thru these studies and publications we hope to serve the cause of education in Indiana in an even larger way than by direct service to the schools. If the cordial response with which this movement has already met should continue, we expect from year to year to increase its scope in order to attack other problems as we get to them.

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[4] *Indiana University Studies*, No. 27.

[5] *Indiana University News-Letter*, Vol. II, No. 12. December, 1914.

It may seem to some of you that we are undertaking a large task, but at the risk of seeming even more visionary, I am going, for the sake of clearness, to tell you how the situation appeals to me. From what I know about certain universities of America, and from what I read in journals of psychology, sociology, medicine, and education about what is going on in other universities of this country and Europe, it seems to me that there is a great deal of information concerning educational matters which plays very little, if any part, in school work. Meumann is working on the memory; Thorndike and Courtis are developing standard scales; Terman is revising the Binet scale; Goddard is studying the causes and consequences of feeble-mindedness; Yerkes is developing a "point scale" for the measurement of intelligence; Winch is studying the perceptions of children; Stern is working on individual differences; Ayres, Strayer, and Cubberly are studying the problems of school administration, and one might continue the enumeration thru a much longer list of men and problems. These men and their studies are so widely scattered that it is difficult for any considerable number of Indiana school men to reach them. My idea is to make Indiana University a relay station for the best there is anywhere in the world in educational science. We would have wires from every productive university and scholar in the world to the library, laboratories, and faculty of this institution, and from this institution to every part of this State so that Indiana school problems may be solved in the light of the best knowledge there is. When at all possible we will bring the scholars themselves here as we did a year ago, and as we are doing again this year. We will keep ourselves alert year by year to add whatever we can to what they bring, we will welcome contributions from you, and in all these ways we will strive to have everything as good as we can make it. Working altogether we shall serve ourselves, and the larger society of which we are a part.

FRIDAY AFTERNOON SESSION

The conference was called to order by W. A. Myers, Superintendent of the Hartford City schools, presiding officer for the afternoon.

Mr. Myers: One year ago the first Conference on Educational Measurements was held in this city. We come now to the second session of the second Conference on Educational Measurements. A word of explanation is necessary with reference to the program. Dr. Courtis was detained this morning because of failing to make train connection in Indianapolis. He came overland in an automobile, so that he might be here this afternoon. The talk that he was on the program to deliver this morning will be given at this time. After his address there will be a short intermission, and then a second address will be given by Dr. Courtis.

I should like to say, if you have any questions you want to ask Dr. Courtis on the first lecture make a note of them, so that you may ask them when the roundtable discussion comes on after the intermission.

I now have the pleasure of presenting Mr. S. A. Courtis, Director of the Department of Educational Research, Detroit Public Schools, who will address you upon the subject, "Supervisory Control by means of Objective Standards".

SUPERVISORY CONTROL BY MEANS OF OBJECTIVE STANDARDS

Mr. Courtis: Mr. Chairman, ladies, and gentlemen, it is a pleasure to come before such superintendents and teachers as those who attend the conferences here at the State University. In no other State can we gather together as large a group of people who are working unitedly on this problem of measurements, at least so far as my observations go. Some other States are pushing you pretty closely. You want to look out for Kansas and Iowa. Some of the southern States are getting interested also, and I hope that before very long we may have, not a State conference, but a national conference where we may bring together the results from the various States. At any rate, it is always a pleasure to come here and meet people who are working on these topics; and, thinking over what I should say to you, I decided that perhaps the best thing I could do would be to present in an orderly fashion the different ways in which the standard tests which are now available for school work may be used in problems of supervision and in problems of teaching.

I am going to take up this afternoon the question of the use of the standard tests for problems of supervision, and in order that you and I may understand each other I am going to give you in my first slide an outline of the points which I wish to cover. I do not know just how many of them I can cover in the time at my disposal but I should like to discuss as many of them as possible.

You will find in this slide, for instance, that I have listed a selection of those problems which seemed to me very vital in the work of supervision and superintendence. Three of them you note I have described as mechanical. Three have in them the problems of control of human agents. To my mind the very first question we have to settle is what we want our schools to produce. What kind of product are we going to have from the work that we are doing? I do not see how we can do anything well when we have no clear conception of what it is we are trying to do. So that the very first work of supervision is to set definitely the aim of the teaching, the products which are to be produced by the school work. Ordinarily you will find these formulated in the course of study. I want to make clear this afternoon the importance of objective definition of aim as a factor in the making of courses of study.

The second point we have to take up in connection with the school work is the study of the method by which the aims are to be reached; such methods as are ordinarily represented in textbooks, or devices of various kinds in the classroom. In educational measurement we have already arrived at a place where standard tests can be used to very great advantage to settle all such questions on a basis of reliable information as to the actual effects produced.

The third type of factors that needs to be considered are those which affect the conditions under which teaching is done; the amount of time given to the subject, for instance. As I looked over the reports of your superintendents this last year, I found a wide variation from one city to another in the time given to arithmetic. I am sure that when those results are available for you all, there will be changes in your procedure. My third point is therefore that no superintendent now has a right to make a fundamental change in the conditions under which his work is done;

that is, change in size of class, in amount of time given to subject, or in other conditions of that sort, without having a basis of measured fact for determining the effect of that change. Measurements with standard tests make such study possible.

On the other side of the work of supervision there is this problem of the control of the active agents in the teaching process. How is the superintendent to do that? After he has set his standards, are his teachers going to carry out his ideas and get those results the way he wishes? All of you know very well that if left to themselves, the teachers will fall far short of the plans the superintendent has made for them. One of the very serious problems of supervision must always be how to give the teachers the proper inspiration and training, how to control them, yet set them free, and I hope to show you that here as elsewhere standard tests are of very great assistance.

The next slide will show the important products of education.

Here again I want to divide the things I have to say about the products of education into two parts; for at this point there is a chance for grave misunderstanding, and unless you and I understand each other here, you are likely to misinterpret all that I have to say later.

We have two types of products: those easily measurable and those which are measurable only with difficulty. Among the easily measured products is that of physical development. We do not know much about that. As it goes thru school, the child develops anyhow, physically and mentally, much as the trees grow, but what I want to call your attention to is that for many years we had units of measurements for the physical development of the child, altho some of you superintendents have not made very much use of them. Weight, vision, lung capacity, and many other important facts are easily measurable and I want to prophesy that you will eventually come to see that a very large part of your problems is bound up in these measurements.

Another product, especially in the early grades, are the mechanical skills, that is, handwriting, reading, and the like. In addition to these, the third type of product also is of very great importance, the habits of work which the child forms. These have not been measured much yet, but they are easily measurable, and I think that in the next year or two you will find many studies of this sort.

If you take the other part of the school work you find we have, first of all, this question of knowledge, which we have always measured more or less, but measured very poorly. The ordinary examination is an attempt to measure the development of knowledge. Then there are a number of tests, like those range of information tests, which are designed to measure the actual knowledge which the child has received from his course. I want to make the point that all knowledge of this character is only measurable with difficulty. It will be some time before such measurements can be made satisfactorily because in all such measurements either reading or writing enter, and until our English work is brought under control, we shall be unable to interpret correctly the results secured.

For the same reason I say that it is difficult to measure the amount of culture which the child gets from his course, but I want to make this point with all of these, that they are measurable. If, for instance, I could follow the children of your geography class to Sunday School and hear them sing; if I had any way of determining what was going on in their minds as they stood up and sang:

What though spicy breezes,
Blow soft over Ceylon's isle;

if I could trace their thoughts and emotions as they sing those words, could I not then tell very definitely the cultural effect of your geography teaching? It is difficult to make such measurements now, but they will be made ultimately, as will also measurements of those other products, the ideals and inspirations which the child gets from his work.

Do not misunderstand me. Measurement as you know is new. We have not been working at it very long. I think everyone who is measuring, who is doing any work in measurement, recognizes that the highest product of school training is that which leads to the development of ideals and character in the children; but some of us have become so convinced that successful work in this line is absolutely dependent upon the successful work in developing the fundamental skills, that we are giving our attention almost wholly to the mechanical elements. In other words, at the present time, most of the work, the successful work in measurement, is being done at this point (indicating); and if you entirely misinterpret a great many other things, I say to you, please understand that such work is being done in order that these lower mechanical products may be gotten out of the way as quickly as possible in order that this other work may be better done.

I call the attention of everyone here to the fact that you are now giving time to the development of these mechanical skills. In my judgment you are giving too much time, doing the work entirely too inefficiently. You are taking from the child a great many opportunities he might have for cultural and inspirational work because of that inefficiency; and my purpose in the work which I have to do is to so arrange the methods of school work that we may get the mechanical skills out of the way in the least possible time and in the very best way, to save time from them for the more important work which is represented on this side of the chart (indicating).

If you understand that point clearly there will be no danger in my talking to you for the rest of the time about these mechanical skills, but unless you do understand it you will fail to give me the credit which I deserve for the kind of work which I am doing. I am working for precisely that thing which everyone of you is working for, the development of the highest interests and the highest ideals of the child. The studies which have been made so far show very plainly that the cultural and inspirational work is conditioned by the proper equipment of the child with the mechanical tools by which all mental work is carried on. Therefore we are giving our time to such mechanical skills; not neglecting the cultural works, but on account of the increased efficiency of our mechanical work, actually giving more time to this phase of the child's development than we have ever given to it before.

Let us pick out one of these particular mechanical skills and see what can be done in the way of defining the course of study in objective terms. If you will look over your course of study, unless it has been rewritten in the last year or two, you will probably find that it says that a child ought to be able to add, subtract, multiply, and divide with a reasonable degree of rapidity and with sufficient accuracy, etc. As I see it the attempt to measure is the attempt to determine the amount or the degree of skill and accuracy which is reasonable.

SAMPLE EXAMPLES FROM A SERIES OF TESTS IN COLUMN ADDITION. EACH TEST WAS COMPOSED WHOLLY OF EXAMPLES OF ONE TYPE, AND WAS OF SUCH LENGTH THAT NO ONE FINISHED IN THE TIME ALLOWED

A	C	E	F	G	I	J	K	L
8 3 (B) 7 4 (H) 9 2	5 6 2 7 (D) 7 6 2 7 4	9 3 6 4 8 2 3	4 7 2 2 4 9 2 5 2	7 5 8 9 4 3 9 7 9 7 8 5 2	8 3 4 4 7 8 7 6 2	3 49 66 75 32 96 85 64 59	4 557 892 347 562 738 658 273 797	8 9,659 3,778 9,484 5,247 8,470 7,966 6,323 3,277

If we try to make our aims definite we shall find by measurement that addition is not a simple thing. Take, for instance, the accompanying examples. I want you to notice that these examples (A) have only one addition. These (B) you see have three. These (C) have more, and you see the columns increase in length.

Here is an example (L) made out of several columns of the same size, and so on. A little psychological study will show that each of those abilities is a different ability. The child may be able to do test "A" without being able to do "C"; able to do both "A" and "C" and not able to do "L"; and so it goes. What do you mean by ability to add? It is not enough to make a general aim of that sort. It must be definite and specific.

In the slide (Fig. 13) now before you I have the actual records of children tested by those examples of the different types. The numerals at the bases of the graphs indicate the number of additions per column. The scale on the left of the figure shows the number of additions made per minute. It is my own record. You will notice up here at the top that I add quite uniformly at the rate of seventy-two additions per minute, whether the column be two figures long or thirteen figures long. The size of the column does not regulate my rate of addition for the first minute.

Now look at this curve (indicating Fig. 13, graph LF). If the column is one, two, three, or four figures long you notice the rate is constant. Two more figures on top of that will reduce the rate. To add columns six figures long is not the same thing as to add columns of four figures. The first are about twice as hard. Look at this one (indicating Fig. 13, graph A). This child leads this particular class on the single column addition, but by the time you get out here (indicating) to twelve figures in the column, you will find that child is at the lowest end of the class. You see how the rate decreases. And so if you study those curves you will find that each individual child will respond differently to those different types of examples.

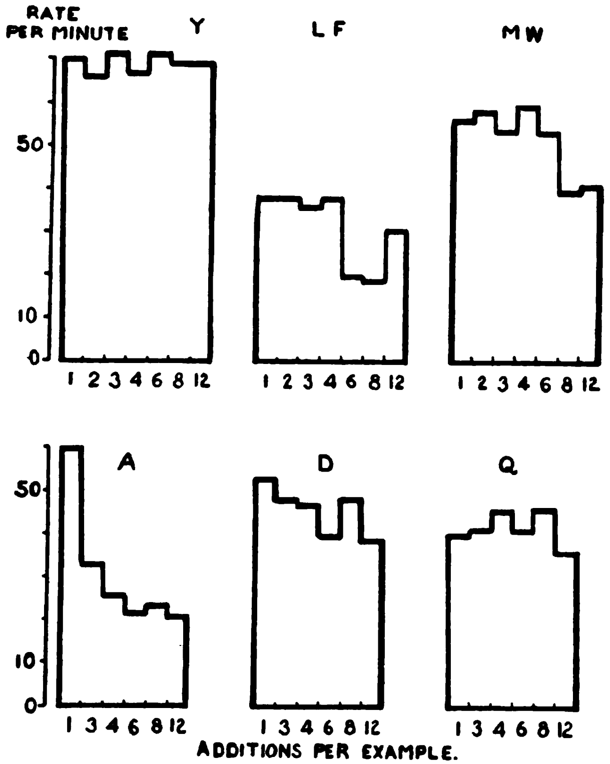


FIG. 13. CHANGE OF RATES WITH COLUMNS OF VARYING LENGTH

Vertical scale = number of additions per minute; horizontal scale = number of additions in each example of the test

If we want to define addition we must define it in such a way that it will cover all the abilities which are involved. I have listed here four of the important abilities which enter into addition. Thorndike says that psychologically there are ninety odd, but these four are the four that must be controlled. The others are purely psychological in their nature, and are controlled indirectly. The first one is of course that the child must know all the addition combinations; and you will find in these four examples that all the addition combinations, the one hundred odd—there are not quite one hundred there; some of the zeroes and ones have been omitted—are represented. So practically all the combinations are represented in the group of four examples.

Another thing we must look out for is carrying. The ability to carry is quite distinct from the ability to add, and has to be provided for separately. Therefore, we have several columns. Then we have the question of attention span. I just showed you (Fig. 13) the graph where the child could add when there were four additions and could not when there were six. The length of the span for most children is about six additions, so that we must make these columns eight or nine figures long in order to test the question of attention in the addition span.

Finally, there is the question of endurance. My own range is seventy-two additions per minute for the first minute. In four minutes that has dropped off to something like fifty-two. Therefore, we must make the test long enough to test the question of endurance in this one ability. We can do that by setting the time for a test in addition like this (Arithmetic Test No. 1—Addition) as eight minutes.

ARITHMETIC TEST NO. 1. ADDITION (SERIES B)

You will be given eight minutes to find the answers to as many of these addition examples as possible. Write the answers on this paper directly underneath the examples. You are not expected to be able to do them all. You will be marked for both speed and accuracy, but it is more important to have your answers right than to try a great many examples.

927	297	136	486	584	176	277	837
379	925	340	765	477	783	445	882
756	473	988	524	181	697	682	959
837	983	386	140	266	200	594	603
924	315	353	812	679	366	481	118
110	661	904	466	241	851	778	781
854	794	547	355	796	535	849	756
965	177	192	834	850	323	157	222
344	124	439	567	733	229	953	525

Now, the minute you have a test of that sort and you are ready to say "I want to teach the children to add examples of this type", the question comes up right away—I think you Indiana people are ready for it—What standard shall we set for the schools? For the different grades? And I have listed here the factors I thought ought to be considered in setting up a standard.

You notice I divide them again into two groups; those beyond control and those under control. Of those beyond control, I put first innate capacity. I will show you what I mean by that in a few minutes. Another factor is the way in which the mind and hand are geared together. A third factor is the maturity of the child, not in years but in development. Referring to the other type of factors we can control the amount of time we give to the subject. Our standards must also be determined somewhat by the relative value of the subject and somewhat by the social needs of the average child; so we must keep track of these different factors as well. Let me show you what I mean by each of those.

Here (Arithmetic—Test No. 3) is a test, for instance, of the multiplication table. How many answers in that test could you write in one minute? We have other tests of that kind in addition, subtraction, multiplication, and division.

ARITHMETIC—TEST NO. 3. SPEED TEST—MULTIPLICATION

SCORE—No. attempted .... No. right ....

Write on this paper, in the space between the lines, the answers to as many of these simple multiplication examples as possible in the time allowed.

2 3 9 0 7 1 3 6 5 4 - - - - -	9 5 4 7 6 1 2 8 0 5 - - - - -	4 2 7 4 9 1 9 6 0 5 - - - - -	3 4 9 0 5 2 7 8 2 6 - - - - -
8 2 7 5 4 1 6 9 0 6 - - - - -	2 5 6 0 7 3 5 9 8 3 - - - - -	1 2 7 0 8 6 8 7 6 3 - - - - -	1 2 8 1 5 9 5 7 1 3 - - - - -
6 2 8 9 5 1 7 4 0 7 - - - - -	4 3 9 8 6 2 6 7 0 4 - - - - -	1 3 7 6 5 2 5 8 0 9 - - - - -	3 2 6 0 8 1 4 7 1 5 - - - - -
1 3 6 0 3 7 4 8 0 9 - - - - -	1 6 8 0 9 4 2 8 7 3 - - - - -	1 4 8 0 4 5 4 9 3 5 - - - - -	7 3 9 2 4 1 8 9 0 3 - - - - -
5 8 6 0 5 1 2 3 9 4 - - - - -	1 9 8 0 3 3 2 6 4 7 - - - - -	2 5 4 5 7 2 8 9 0 5 - - - - -	1 6 9 1 7 8 2 4 0 2 - - - - -
9 5 4 7 6 1 2 8 0 5 - - - - -	2 3 9 0 7 1 3 6 5 4 - - - - -	3 4 9 0 5 2 7 8 2 6 - - - - -	4 2 7 4 9 1 9 6 0 5 - - - - -

Name .... School .... Grade ......

Here (Arithmetic—Test No. 5) is another test in which there was simply the copying of figures.

ARITHMETIC TEST NO 5. SPEED TEST—COPYING FIGURES

SCORE—No. attempted .... No. right ....

Name .... School .... Grade ......

Copy on this paper, in the space between the lines, as many of the printed figures as possible in the time allowed. Write as rapidly as possible, but form the figures as carefully as in working examples.

24967	42976	62947	72964	24976	42967	62974	72946
26974	46927	64972	74926	26947	46972	64927	74962
27946	47962	67924	76942	27964	47926	67942	76924
24967	42976	62947	72964	24976	42967	62974	72946
26974	46927	64972	74926	26947	46972	64927	74962
24967	42976	62947	72964	24976	42967	62974	72946

Fig. 14 is the record of an individual tested with the tests in such a way that we can compare the records.

On the first trial this individual girl, in May, 1910, wrote fifty additions in a minute. She wrote forty-four in subtraction and comes up to sixty-three in multiplication, and down to this point in division, and copies one hundred figures per minute. Now that individual had five tests in succession, and of course when you take five tests in succession there are changes in your score. You note the different trials, one, two, three, four, and five.

The thing I want to call your attention to is the inequality of her development in these different operations. You notice how much better she is in addition than in subtraction; how much better in multiplication than in division. The second record was made two years later by a different examiner, using a different edition of the same tests, and yet you see how those inequalities of development have persisted, and practically in the same relative degree.

Suppose I should test all these individuals in this room in the same way, what kind of scores would we get? We would get results corresponding to this (Fig. 15) where we have different types of individuals. I want you to see that those two individuals, twins, who look alike in their faces are alike in their minds. Both add better than they subtract; subtract better than they multiply; divide better than they multiply, and copy figures quite rapidly. In the left-hand graph we have two twins that are similar. You see how close the resemblance is in those two individuals. In the right-hand graphs we have two dissimilar twins. These twins do not look alike in their faces. You would not know they were twins to see them. This one adds better than he subtracts, but this one subtracts better than he adds. If you follow the two curves you see how opposite they are all the way thru. In this case the unlikeness of their physical bodies is paralleled by the unlikeness of their minds.

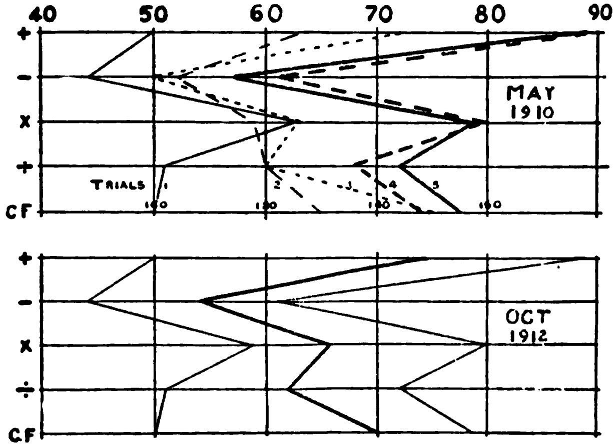


FIG. 14. SCORES MADE BY A SINGLE INDIVIDUAL IN A PRACTICE SERIES OF 25 TESTS

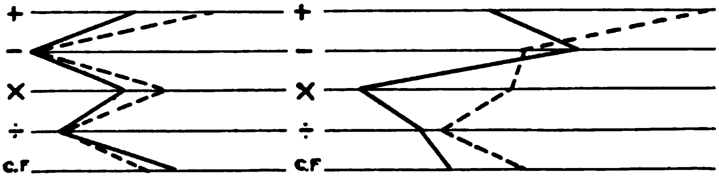


FIG. 15. CURVES SHOWING RELATIVE DEVELOPMENT OF TWO PAIRS OF TWINS IN FOUR OPERATIONS

What happens now if we test the whole family? We get results like this (Fig. 16). Here is the father, an architect, a college graduate, a man who uses his mathematics. He wrote eighty answers per minute in addition. He does not do so well in subtraction; is lower in multiplication, and comes here and here in the other two tests.

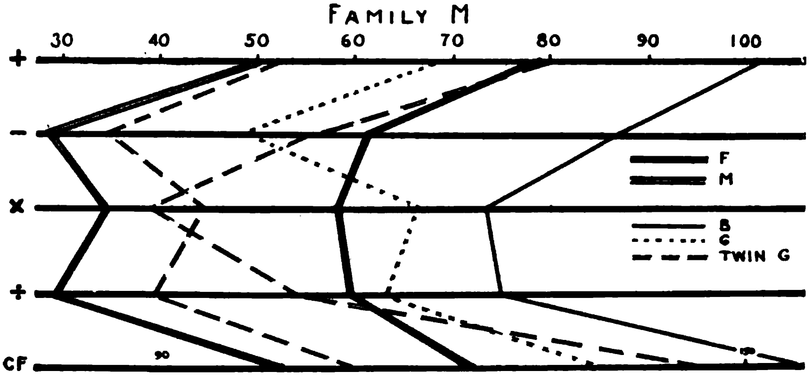


FIG. 16

This is the curve for his wife, coming down this way. You see they are opposite. I want you to notice that the man is weak on multiplication and the mother is strong. Now what about the children?

This (indicating) is the oldest boy, a grown man now, also a college graduate. Compare that curve with the curve of the two parents. Do you need to be told that he is a chip of the old block? Or what do you say about this girl here (indicating) whose curve follows the mother's so closely?

The particular point I want to make at the present time is this: Those children were trained in a different school, in another generation, and under different teachers from their parents, but the product is the same. How much control did the school have over that product? How far was the innate capacity to learn multiplication the determining factor in how much multiplication the girl learned? The interesting thing about the slide to me is the fact that these two lines are twins, this one resembling the father, and this one resembling the mother; one twin has the father's weakness in multiplication exaggerated, while this one is like the mother and has the strength in multiplication.

Now those two children had the same opportunities, the same training, and yet you have the slower sister leading her more highly organized twin in the one thing in which she has inherited strength from her mother. So I say, the first thing that determines the standard must be the degree of capacity which the average child has for the type of training which we want to give him. We cannot fix that standard irrespective of the child. We must measure the child and see what he is capable of attaining under given conditions.

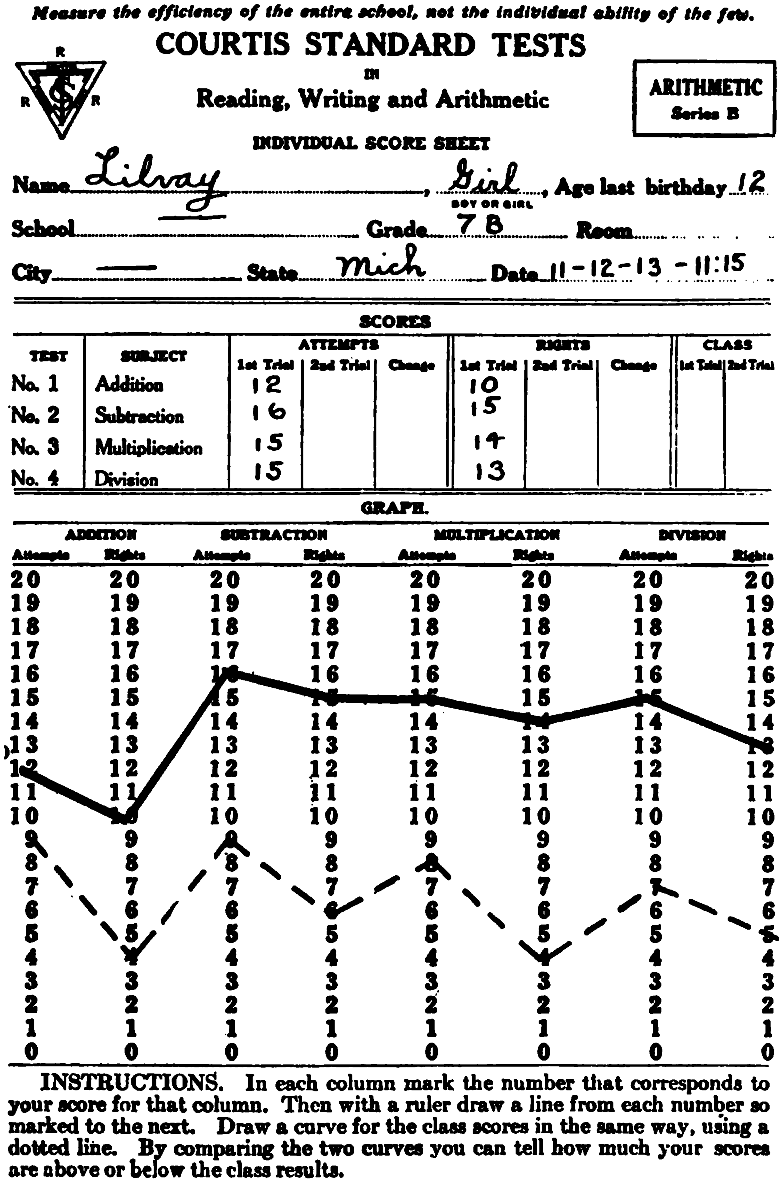
Not only is the response of the child determined by the character of the brain cells in him; not only do we find that he can do much more in certain fields than in others, but in all work in which nerves and muscles are included they are also a determining factor. Some people can set free energy at a very great rate; other people can move their hands and fingers but very slowly. We must take into consideration the speed and accuracy which it is possible for the average child to attain. In other words, our standards cannot be set arbitrarily. We must measure and find out every time exactly what performance the human machine is capable of before we can set any sort of reasonable standards.

Still another factor is maturity. Here is a test in which there is no thought element. The child is simply to copy those figures. How many figures can you copy in a given time? Purely nerve and muscle and eye. Almost any child, even the children in the kindergarten, can take this test. In New York City we measured twenty-seven thousand children and here is the result—twenty-seven thousand, of grades ranging from three to nine. Note the gradual progress in the curve. That is not due to training, or to incidental training at most; for we have evidence to show that the simple "getting older" of the child is enough to raise its score in this operation.

The child's ability changes irrespective of your teachings, simply because that child is growing older. His nerves and muscles are maturing, and there are changes taking place which enable him to perform in a way differently from that of the year before.

We have to take that fact into consideration also, and set our standards in terms of the development of the child.

I want you to notice the record (Fig. 17) of a certain individual in the additional test. This was the test I showed you before in addition. There is a similar test for subtraction, multiplication, and division. The broken line is the record for the class. The solid line is the record for an individual in the class. I could duplicate this record from your classes everywhere. You notice the class is low. It evidently needs training. It is lower than the average



Measure the efficiency of the entire school, not the individual ability of the few.

COURTIS STANDARD TESTS

IN

Reading, Writing and Arithmetic

ARITHMETIC
Series B

INDIVIDUAL SCORE SHEET

Name Lilray, Girl (BOY OR GIRL), Age last birthday 12

School ——— Grade 7 B Room

City ——— State Mich Date 11-12-13 - 11:15

SCORES

TEST	SUBJECT	ATTEMPTS			RIGHTS			CLASS	
		1st Trial	2nd Trial	Change	1st Trial	2nd Trial	Change	1st Trial	2nd Trial
No. 1	Addition	12			10				
No. 2	Subtraction	16			15				
No. 3	Multiplication	15			14				
No. 4	Division	15			13				

GRAPH.

INSTRUCTIONS. In each column mark the number that corresponds to your score for that column. Then with a ruler draw a line from each number so marked to the next. Draw a curve for the class scores in the same way, using a dotted line. By comparing the two curves you can tell how much your scores are above or below the class results.

FIG. 17

of most classes. This girl is very high, and works very accurately in everything except addition. Even in addition she was very high compared with the class. How much more training does she need? How high shall her score go before her work in addition is finished? That question, in setting the standard, must be determined not only by the factors of which I have already spoken, but by the further factor of the value of addition, and the need for addition in the life of the child. We haven't very many figures on that. We are getting more. Miss Baylor, of your own State, has supplied some information by measurement of people in certain industrial positions, so that we can begin to see where abilities are essential to social efficiency.

In the next slide I can show you how much superintendents can do; that is, superintendents in Iowa. If I were to measure superintendents in Indiana I should get similar results.

We had at a conference forty-four superintendents and teachers, mostly superintendents, and instead of asking them to write their names I had them write their salaries. They ranged like this (indicating). One man only was earning from five hundred to one thousand dollars; fifteen from one thousand to fifteen hundred, and there was one man who was earning forty-five hundred. What kind of scores would they have in addition? Is there any connection between salary and ability to add, as measured by this test? The evidence from this and other records tends to show that there is; that if you start out with zero on the scale your salary will increase as your ability increases up to a certain point. In this particular group of superintendents we did not get on a curve at all until we reached this point (indicating). This man who had the lowest salary had also the lowest score. Of course that is only one case. I have other records of this kind which fill in the curve.

Notice this group of fifteen who had this salary (indicating). Their range was from that score down to this score. The median falls here (indicating).

The median of this group is here (indicating) and the median of this group is here (indicating); and if you take the median of these other groups you find it follows along that line.

Now I have repeated that experiment on a good many groups. I am quite sure if I should attempt that experiment here, your average score in addition would be just about sixteen examples. In other words, sixteen is the average of adult ability.

I have measured a number of bookkeepers and a number of other people engaged in commercial work. I know that they varied from twenty to twenty-four. I have some of them whose scores run up as high as forty to fifty and sixty in the same time. There is no limit, apparently, to ability in addition. Where are you going to stop? How much should an eighth-grade child have? If you are going to give all he possibly can take, he is capable of training up to adding sixty of those examples in eight minutes. If he has no training he will be unable to do any. Where are you going to put the goal? I say that the goal should be fixed at the average, the median speed of children of that age or grade. If we take the median speed for the grade we have a speed which can be reached by at least fifty percent of the children. A very striking thing comes out when you come to measure the classification and distribution in the different schools. In any of them you will find some children very high and in any of them you will find some very low. The median for any grade, however, will not be very different.

TABLE V. STANDARD INDIVIDUAL JUNE SCORES IN NUMBER OF EXAMPLES ATTEMPTED (SPEED)

GRADE	Test 1 Addition	Test 2 Subtraction	Test 3 Multiplication	Test 4 Division
3	3	4	3	2
4	5	6	5	4
5	7	8	7	6
6	9	10	9	8
7	11	11	10	10
8	12	12	11	11

Standard accuracy = 100%

In the accompanying table (V) you notice the standard scores as we have them determined. Professional ability ranges from twenty to sixty. The ordinary adult who is not using his mathematics professionally has a score of about sixteen. Now considering the maturity of the children, twelve is a reasonable score for eighth-grade and twelve is just about the median speed of work. As we follow down the line we find that we get a score of three for the third grade.

Now we have a new situation. We can say to the eighth-grade teacher, "Your work is to develop the adding ability of the children until they are able to add twelve examples of the type shown there in eight minutes. When you have finished that work you have finished the amount of training in addition which you should give." That is a perfectly definite task. If I ask a carpenter to prepare this stick I give him definite specifications, length, width, and thickness, and the kind of wood. When he gets thru he knows whether or not he has come up to those specifications. If it is important that it should not be six inches shorter, and he brings me one six inches shorter, I can reject it because it does not come up to the specifications. Why should we not give our teachers just exactly as definite specifications in every mechanical skill, because it is the degree of skill and not the skill itself which is called into question by different people? The business man does not say the child does not know anything about adding. He says he does not add at the proper speed and with proper accuracy. He does not say the child does not understand English at all. He says he is not intelligent and cannot follow directions. He does not say he cannot read. He says he reads too slowly, and misunderstands what he reads. Why should we not, where we are dealing with mechanical skill, give absolutely definite specifications of this type?

For instance, here is the question of reading and writing numbers. You all teach that. Why not make your course of study like this? This is the course of study which I had for my teachers. We want the children to begin and read single digits. They must be able to read numbers as large as this (indicating) before we get thru. Here is the sixth grade, from this point to this point (indicating). All of the children ought to be able to read numbers so large (indicating), and if they can read them they can read those below them. If you specify the product like that, it is possible to make a test like this (indicating), which would involve ten of the numbers within that range. You notice this number has every figure, and this one has ciphers in it; so that we cover that difficulty.

The minute we have a definite specification of the aim of teaching, then we can say that a sixth-grade child ought to be able to read the test in a proper time; in this case the time was forty-five seconds.

Now unless you have tried the attainment of a definite objective goal of that kind, you have no conception, absolutely no conception, of what in the way of effort or in the way of change is required in the children to enable them to reach that goal. It is true that this particular test is a trivial point of mechanical skill, but nevertheless it has value, and it permits of the idea of measurement of the children at the beginning to determine where they are, of excusing the children who have already attained that goal from the class work, thus saving time from that for more important study, and it means the possibility of keeping track of the children as they work along, and of setting them free from the drill work the minute they reach that goal.

Take this question of fractions. Instead of saying the children should add, subtract, multiply, and divide fractions, why not specify that the denominator shall not be larger than twenty-four? We do not use fractions very much larger than that. Why not specify the character of fractions; that they require the simplest reduction to a common denominator before they are added, and that after they are added, they will require reduction to a mixed number? You will find that these examples are made on definite specifications. I can make any number of tests of that character.

If you are teaching fractions to the sixth grade, you tell them that they must practice working with fractions until they can do the eight examples correctly in five minutes. Then you transfer the responsibility to the child. That is the child's job; not the teacher's job. She is there to help, but the child must make an effort; and when he makes the effort, let him attain to the skill in the easiest way. Here again, as soon as the essential skill is attained, it is perfectly possible to excuse him from that useless mechanical work and put him at work at something which will develop other abilities worth so much more than this.

The same thing is true in handwriting. I use this illustration because I think Professor Thorndike was the first one to put out this idea of the limitation of training. He suggested that thirteen on his scale was good enough for all practical purposes, and when the child had reached that he ought to be excused from his handwriting drill. How many children have you in your drill classes in writing whose writing is better than thirteen? Or sixty on the Ayres scale? How many have had that ability for several years; have gained absolutely nothing from their drill, and yet who take their drill day after day? I can tell you pretty closely. Efficient handwriting instruction is about twenty percent, that is, about one child in five can probably do better than thirteen on this scale. Why should not those be excused from the handwriting drill, providing their English papers and spelling papers are up to standard? Have you ever tried it? It totally changes the situation, because then the child has an incentive to practice. If he is going to take the drill needlessly it is something that he endures. He takes no direct part in the work himself and is indifferent about it.

We can do exactly the same thing with reading. The eighth-grade child ought to be able to read about two hundred and thirty words a minute, and be able to remember half of the material which he has read on one reading (for a short paragraph). You can do the same thing with English composition. It is perfectly possible to define in very definite terms exactly what you mean by the standard to be attained in any grade. In this grade we have the first part of a story which was dictated to the children, and the children were asked to complete the story.

The next slide will show the papers turned in by the teachers after being marked by them.

The teacher in this case called this an "A" paper—I don't know whether you would or not. The teacher in this case called this an "E". I don't know whether you consider that bad enough for total failure or not. But if all the children are tested under uniform conditions and the results are brought in in this way, the scores of the different teachers brought together will give a chance to see very definitely just what the standard for any system is.

I have posted on the wall as one of my charts a series of five papers marked "B" by the teachers, that you may see the variation from school to school. I have put there also a series of twenty-five papers representing standard samples, "A", "B", "C", "D", and "E", for each grade from four to eight—these are from a combined group in my own home city—in order that you may see a collection of such samples together. After securing samples of this kind, they may be marked by scales for turning the scores into marks on an absolute basis.

We have done that in one school system. In other words, here is a group of thirty or forty papers submitted by thirty or forty teachers. This represents the value on the Hilligas scale for that particular "A" paper. That was a representative paper of all the "A" papers. The same way this was representative of the "B" papers, and that of the "C", and that of the "D", and that of the "E", making marks of excellent, good, fair, poor, and failure, represented for each grade. If we compare all these samples with the Hilligas scale, and turn these marks into a definite absolute measure along an objective scale, we can see that the progress from the fourth to the eighth grade in "A" papers is represented by that line; but if we compare these (indicating) you will find that in this particular school system the "A" paper of the fourth grade is just about equal to the "B" paper of the eighth grade. That is, the progress from the fourth to the eighth grade in English composition in this school system was such as to change the value of a mark just one grade. Thus it is possible to formulate in very definite terms, and to define the ability which should be attained at each grade in English composition.

Fig. 18 is a collection of eighth-grade standards in English. For handwriting, sixty by the Ayres scale; for rate in writing the original story, that is, rate of composition, about eighteen words per minute. Such measure may seem like a mechanical thing, but it measures very well the degree of imagination of the child, if you use with it the quality of the child's composition.

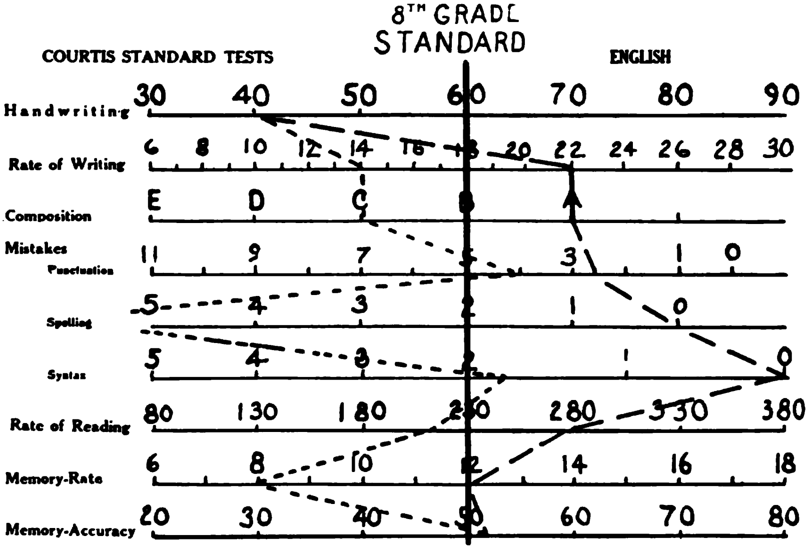


FIG. 18

He ought to be able to read about two hundred and thirty words a minute and reproduce what he has read at the rate of about twelve words a minute, and have about fifty percent of his reproduction like the original. If you carry such records thru with a single individual you get a curve something like this (indicating). You see how far this particular individual exceeds the standard. On the other hand, you see how much this one needs training. It is above the standard here (indicating), and here (indicating), and below here. Why should we not pick out points of excellence in the child, and excuse him from drill work of that kind, and let him concentrate on the things in which he is weakest, and in which the child needs drill?

My point is that your course of study at the present time could easily be filled with many definite objective statements of aim which would be so specific that they would aid the teacher to determine exactly when the child's mechanical work is completed, and would enable him to control by these standards the amount and character of drill work done in your different school systems.

Now what about methods? Once you start out to try to reach a definite objective goal of this kind you have a chance to express the degree of success you have in that work. We tried that in Detroit. We started out at the beginning with work in the tables. We found we did not have very much progress. We found finally that there was little correlation betwen tables and the use of them. So we tried the method of working without any tables, that is, teaching a child the addition combinations while he was learning to add —teaching him directly. Here is the result.

These two schools carried on the work in the regular way. These two, 334 children, had the number book. These two had the same amount of time given to oral drill, because the superintendent at that time was a very firm believer in that type of work. At the end of the period, about a half-year, the test was made. We graded the children this way. We had 22 percent of the children in this group of schools that gained three or more examples in their score. We had about 37 percent that gained from one to three examples; about 27 percent that showed no change of any kind as the result of that work. We had about 13 percent who lost a little in the score, and about 1 percent that lost a great deal. If you follow that in a diagram, you can see it more plainly. If you compare that with this (indicating), you will see how much better the one method is than the other. It is another case of specific training.

You notice the percents are larger in the direct training method. If you look at the diagram you will find that this radius has swung around until it includes 53 percent, and we have 27 percent making a small gain. You see how much the number of children who make no gain, or loss, has been reduced. I could show you a chart where this radius for a single class has swung around until we had 80 percent of the children in that group (indicating). But we have in a very definite sense a measure of the efficiency of those various methods; and my point is, not this particular experiment, but that this is typical of the kind of thing which every superintendent must do to justify the changes in his course of study or methods of work.

We have in Fig. 19 a record of the changes we have been making. This dotted line is the standard score in speed for the addition examples I showed you before. If you can see this line marked

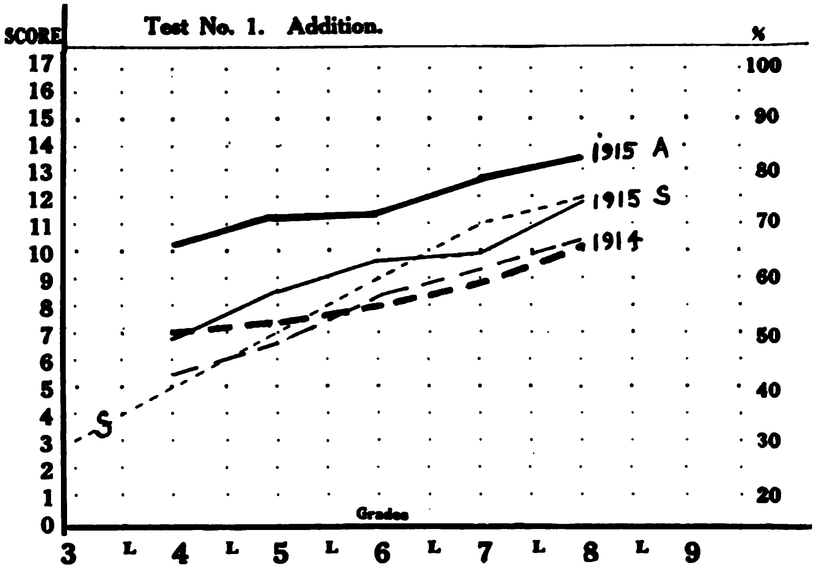


FIG. 19

"S", it represents the speed line for Detroit this last January. The standards of speed are fixed by factors over which the school has no control, but accuracy is determined by the efficiency of the training. The speed curve shows only a small change from the standard, but look at the accuracy line. This curve at present is high. You see where this fourth grade in accuracy is. You will find our present fourth grade in accuracy exceeds that of the eighth grade for a year ago; and I believe they are going to make that still higher. Not all the teachers are using that method effectively, but those who are, are getting results like that. Changes are still going on.

Here again the point is not the particular experiment, but the fact that every one of you every time you adopt a method, ought to have such absolutely definite information, or if you cannot get it from some other school system, you ought, at least, to measure your condition before you make the change, and a suitable time after you have made the change, measure again to prove that the change has been beneficial.

That statement applies, of course, to every condition that comes under your control,—the course of study, size of class, ability, teacher, and every single factor of that kind. What do you know about the effect of size of class, for instance? I wonder how many of you have read Harlan's study of the effect of size of class in the promotion rate? He shows there is no connection, but if anything the larger class is better. Here is the record for five classes of fifty to sixty children. Here are 258 classes of forty to fifty children, and 168 classes of from thirty to forty children. Which of those three groups would make the better score in such a thing as the four operations with whole numbers? The curves here tell the story. This (indicating) is the forty-five, this is the thirty-five. You see in three of the four grades the classes of forty-five are ahead. Here the other one is ahead. Then they go along together, in speed, and the conditions are practically maintained here for accuracy. Where do the fifty classes come in? There were not very many of them, but that dot (indicating) represents one. This (indicating) represents two more. This (indicating) represents the rest of them. You see that in three cases out of four the larger classes are ahead.

Now please do not misinterpret these data. They do not mean at all that the smaller classes are not important, or that smaller classes are of no value, but that smaller classes do not determine the product. When you are dealing with mechanical skills, such as addition, subtraction, multiplication, and division, the small classes is not a very important factor. I would not do anything to discourage the desire to have small classes for many types of work. Nevertheless, I believe you will see larger classes for mechanical work. I think you will see classes of eighty to ninety in handwriting, in spelling, in reading, and things of that nature, which involve merely mechanical skill. For the result is not determined by teaching. It is determined by the changes within the child himself. The main factors are the factors which I have just shown are beyond control; and it is easy to show that when the work is adjusted to take advantage of such factors, you get a very large product.

Suppose you had the choice of a family into which you were to be born when you came into this world. Suppose there were two families where the father and mother were equally cultured, equally well supplied with this world's goods, equally anxious to do their very best for their children; suppose that in one family you would be the only child, while in the other family you would be one of six or eight children; into which family would you choose to be born? When we deal with these mechanical skills we sometimes have to provide special machinery to get the teacher out of the way. It is not what the teacher does that counts. It is what the child does and thinks, and until our work is organized to take advantage of those factors we cannot hope to improve the efficiency very much.

Fig. 20 is a collection of results from classes of different sizes in schools in different counties. A class of thirty-five children from a New Hampshire school, and eight from a little country school in Missouri, a class of forty-one children of the same grade from a school in New England (indicating). Here are the best and worst of twenty classes of the same grade in one city. This is the best score, and here is the worst score. Here is the scale at the bottom. Do you notice how those classes make about the same average score? You see that the distribution of individual scores by classes is about the same for each; for you have some children with very high scores and you have some with very low scores. The conditions are very nearly the same thruout. That is the best class, and that

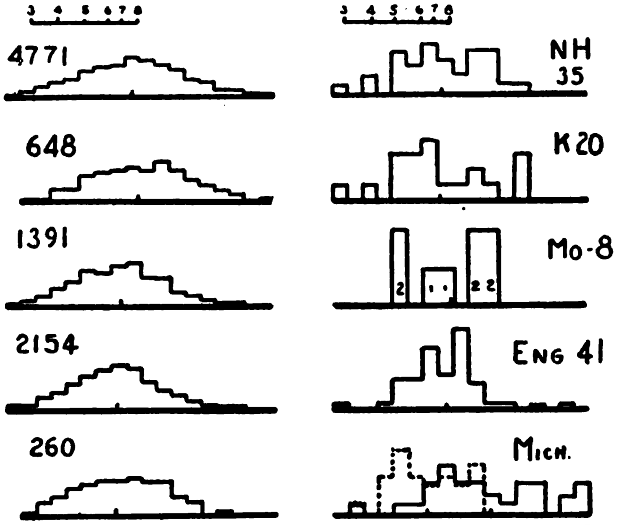


FIG. 20

is the worst class, and yet the difference is only that (indicating). Factors like the size of classes, which we ordinarily think of as important, are really not very important. You have the same thing shown on that side of the screen for the larger groups.

Here is a slide showing the relation between the time given to arithmetic and the product. These schools gave from 17 to 22 percent of their time to arithmetic, and these only from 7 to 10 percent per week to the study of arithmetic. What kind of scores do they make? This score on the top, this X, means the scores of classes in abstract work, and this circle the scores of classes in reasoning. If there was correlation the dots, circles, and crosses would be distributed along a line like that (indicating), but the actual scores follow no such line; instead they fall there and there and there (indicating), which means that the correlation is low.

What did these people in the highest group get for all the time they spent? Going over the results of the Indiana investigation, I find you have a variation for time allowance in arithmetic which corresponds pretty closely to that shown in the slide. What are you going to do about it? Keep on spending time, 22 percent of your time, on arithmetic and getting no better result than these people do who spend but 10 percent of their time? But until you know what the conditions are by measurement, and until you see what you are getting for the time you are expending, the conditions

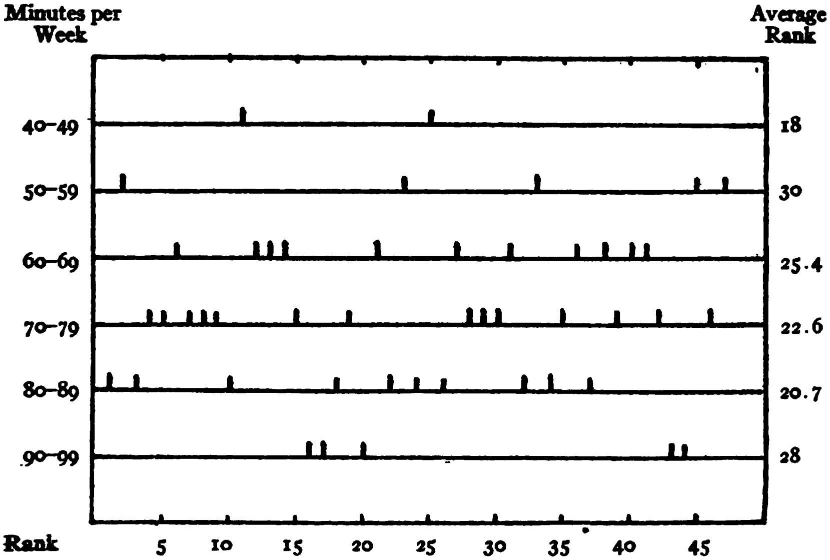


FIG. 21

will never be improved. Time as a factor has very little effect upon the product. If you give too little time you will get a very low product, but providing you give from 10 to 12 percent of your time to arithmetic, your product in these mechanical skills will be as good as any other person, provided you both use the ordinary form of class drill.

Fig. 21 is Freeman's study of the correlation between time and product in handwriting. You notice how little correlation there is. The variation in the amount of time given to handwriting was from forty to one hundred minutes per week with very small differences in the products, and yet I believe that some of you hold that time allowance is a very important factor. My point is merely that now you must justify such opinions in terms of objective results. The time is coming very quickly when such proof will be demanded from the outside, and wise superintendents are now taking steps to get such facts of their own initiative.

Here is the same kind of data on the ability of the teacher. Some of you superintendents are very peculiar. You look the country over to find a fine teacher, one with exceptional training, and exceptional intuitive judgment in the handling of individual children. You put her in a situation where she can make no use whatever of those abilities. By the classroom conditions you put upon her you nullify her ability to work with individuals. As a result the attempt to correlate the ability of the teacher, or the amount of training which she has had, with the results she gets, will show that the ability of the teacher is a negligible factor, when you consider the product in these mechanical abilities.

Here are teachers in Detroit, and their ranks as given on the efficiency cards used in the city. They are divided into groups. This group represents a rank of from 100 to 90; this 90 to 80; this 70; this 60; and this 50. These vertical lines represent by grades the scores made in the classes of these various groups of teachers. Look at the lack of correlation. If you will follow the diagram thru I think you will find there is no correlation between the ability of the teacher and the result that she gets.

Here again the data do not mean that the teacher does not count, altho some people may think that is what it means, but they do mean precisely that so far as mechanical skills are concerned. In the few fundamental operations of arithmetic as measured by these tests, the effect produced by the teacher is not over, at the very outside, three examples. If you were to replace all the teachers that you have by the very best teachers there are in the country over, you could only raise the score of our classes about three examples; but in the meantime the range within your class would be something like thirteen or fourteen or fifteen examples; and the better teachers you have the greater that range will be.

As soon as we have an objective standard of this kind we have a means of measuring efficiency in a way we never had before. For instance, we have in Fig. 22 the record of a single class in addition. These are the scores for the number of examples tried. The little figures written in each of the squares show the number of examples right. That (indicating) means ten tried and ten right. This one means that there was one child who had a score of ten tried and ten wrong; this one two wrong; ten tried, eight right. This represents the product from the class as it is at present. What we want to get, tho, as soon as we have adopted this standard, is twelve tried and twelve right, or better. All such scores would fall somewhere in this rectangle. Now the efficiency of the class, in the teaching of addition, is determined by the percent of the class that comes up to the standard. If you count the number of children that fell in that rectangle, you will find there were seven out of seventy-two coming up to the standard. The efficiency was about 10 percent. The average of efficiency in teaching ranges from 10 to 15 percent. Some people find that very discouraging. I do not see why. It is the statement of a condition which has always existed, but not the statement of a condition which must necessarily exist. Measurement tends to show that results are better now than ever before, and the fact that we are increasing in efficiency is encouraging instead of discouraging. That electric bulb (pointing) is a very inefficient means of converting electric energy into light. We waste a great deal of energy in heat; yet no one would say that it is of no value. So many of those children are not where we would like to have them, but that is because we never before had means of determining what we were doing; and now that we have the means of determining what we are doing we have also the means for improving it.

Take, for instance, the city of Detroit. This last January we had returns from 444 classes. There were 115 classes whose efficiency ranged from zero to 5 percent. Quite a large number—almost seventy-five—ranged from 5 to 10 percent; and so on. You notice also there were 130 classes whose efficiency ranged from 20 to 60 percent. What do you suppose is going to happen to our educational product when the efficiency changes from the present 15 percent to 60, not in 3 or 4 or 10 or 20 classes out of 400, but

Test No. 2. Subtraction. Standard Scores: Grade 3, 4; Gd 4, 6; Gd 5, 8; Gd 6, 10; Gd 7, 11; Gd 8, 12. Accuracy 100%

	Score	Score in number of Examples Attempted																									Total
		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
	% 100	—	1	2	3	4	5	6 3	7	8	9 3	10 1	11 1	12 1	13 1	14 1	15 1	16 1	17 2	18	19	20	21	22	23	24	15
Accuracy	90	Figures in small type indicate scores in number of examples right.		—	—	—	—	—	—	—	—	9 1	10	11 3	12	13 2	14	15	16	17	18 1	18–19 1	19–20	20–21	21–22	22–23 1	9
	80			—	—	—	4	5	6 2	7	8 6	8 2	9 3	10 1	11	12 1	12–13 2	13–14 2	14–15 3	15–16 1	16–17 1	16–17	17–18	18–19 1	19–20	20–21	25
	70			—	—	3	—	—	5	6	7 1	7 1	8 1	9 2	10	10–11 1	11–12	12	12–13	13–14	14–15 1	14–15	15–16	16–17	17–18	17–19 1	8
	60			—	2	—	3	4	—	5 1	5 1	6 1	7 2	8 1	8–9 2	8-9	9–10	10–11	11	11–12	12–13	12–13	13–14	14–15	14–16	15–16	8
	50			1	—	2	—	3	4 1	4	5	5	6	6–7 1	7	7	8	8–9 1	9–10	9–10	10–11	10–11	11–12	11–12	12–13	12–14	3
	0 to 49	0	0	0	0–1	0–1	0–2	0–2	0–3	0–3 1	0–4 3	0–4	0–5	0–5	0–6	0–6	0–7	0–7	0–8	0–8	0–9	0–9	0–10	0–10	0–11	0–11	4
	Total							3	3	2	14	6	7	9	3	5	3	4	5	1	3	1	0	1	0	2	72

Median Scores: Speed 12.0 Accuracy 80.0% Efficiency 7/12 = 10% Standard Scores 12–12

COR. .1 5.1

12.1 85.1

Dif.

17

25

FIG. 22

in the whole 400? It is perfectly possible just as soon as the teachers down here (indicating) can work as these do; and that to my mind is the hopeful feature of the situation.

Never before in the world's history has there been an opportunity like the opportunity before you school men. When people discovered the laws which underlie the action of the electric current a very great development was possible; and when we discover the laws which underlie the development of the human mind and character, the development will be correspondingly great and of correspondingly greater value. I say never before in the world's history has there been an opportunity like that before you school men and women. People who are at work on these problems, striving to change that situation into this one (indicating), have the opportunity to make the largest contribution which has ever been made to our civilization.

There are only one or two more points that I want to touch upon. My time is gone. I will take the training of the teacher.

I think that in the control of the teacher and in the training of the teacher it is only fair that she should use these measures herself. As I go around from one part of the country to another, I find a very great question in the minds of superintendents as to the way in which the tests are to be used. Only yesterday I answered a letter which said that the writer thought it was exceedingly wrong for the superintendent to use a test as a club over the head of the teacher. So do I. I do not believe in the use of a club in any situation, except where you are fighting a wild animal and have to protect yourself. There is no reason for using tests as a club. Why should you not let the teacher club herself? You will find that the teachers as a class are anxious to do their very best. They are suspicious of a person who comes in to test their work because they know that their work does not come up to the standard they would like to have it reach. They know their own shortcomings, and they are afraid when you measure them. But suppose the work is put on the voluntary basis. Suppose they are to use tests to determine for themselves whether or not their work comes up to the standard? To my mind the very finest thing about a standard test is this: It sets the aim and it gives the individual an opportunity to meet that aim in any way he pleases. It gives both control of, and freedom to, the teacher, and those are two things which the teacher appreciates. She wants to know just what you expect from her and she also wants to be free to meet that demand in her own way.

Now in Fig. 23 you have a chart in which all the returns from something like thirty-eight fifth grades are shown. Only one class in a hundred makes a score like that one (indicating). Only one class in a hundred makes a score like this one. What are the teachers of Detroit doing? Those are the returns of fifth-grade teachers. Every one of these black circles means there was a teacher had a score like that one (indicating). You see some of these better results here run away beyond the limit of the usual fifth-grade distribution, especially in their accuracy, not in their speed. Some of the teachers here still lack speed; but every teacher can see exactly how she stands. Now if tests are used as a tool, and if they are used by the teacher willingly, for her own guidance, if they are used from the proper professional spirit, there is no question but that the testing is of very great value; but if they are used as a club I will agree that they are of very little value.

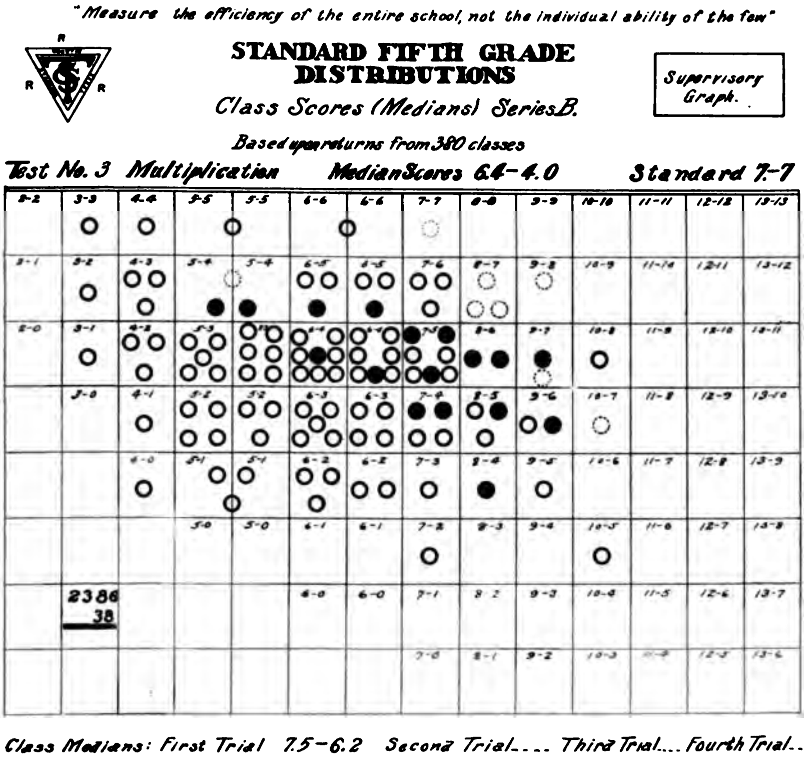


FIG. 23

For teaching it is not necessary to have carefully worked out or standard tests, as some people seem to think. A very great deal can be done under every subject even with the ordinary school examination, if the work is only carried thru in proper fashion.

For instance, here is a measurement of handwriting based solely on the teacher's estimate. We had seven children in this class rated by the teacher as excellent, eight as good, and the rest below. That gives an efficiency of about 15 percent. There is not very much change in efficiency until you get into these grades (indicating), and in here you have the problem of the elimination of some of the poorer children which accounts for the larger percent. How much change is being made in your handwriting by your handwriting work? Is it productive or not? This slide says that it is not, that the increase from year to year is less than 5 percent. Look at these classes, measured by the Thorndyke scale, three sets compared. If you rate their efficiency upon the basis of the number of children who write as well as quality twelve or better, you have 41 percent, 20 percent, and 40 percent. Why should we not measure our product in as definite terms as any other manufacturer? Our products are measurable and definite. Let us keep track of our work in an accurate fashion. Let us be as honest as other people in other fields of effort.

One further point and I am thru. I hear a great deal of protest in different places from people as to the time cost of this measuring work. Many superintendents will start in in an investigation in English composition, or handwriting, or spelling, or arithmetic, and apply tests; and about two years later make a report. Again you have a city like Boston. They tested sixty-six thousand children in three weeks. You have many superintendents carrying the work thru and getting the work back promptly to the teachers, so that the teachers get the results back as a direct guide in teaching. Now that is perfectly possible if the work is properly organized. A great many superintendents are not doing the work themselves. They have not the time. The person in charge of that work brings the principals of the different schools together and addresses them as a class. He gives them the test and drills them in the work in such a way that the principals understand by the actual doing of the work exactly what is wanted, so that they may give the test uniformly. Principals in the same way drill their own teachers, so that the teachers are uniform in the giving of that test from one end of the school system to the other.

Then at a given time and under the given conditions the tests are made.

For a great many of those tests, the work can be reduced to a basis where the scoring need not take more than two or three hours time. This means that if the test is given on Monday and the teacher works a half hour on each of the four succeeding days, the work would be completed on Friday. The result from the different classes would be gathered by the principal the following Monday; and the result from the entire school system would be complete in the hands of the superintendent in a week.

In Detroit, on Wednesday, May 12, we shall give about one thousand tests. By Friday night, barring unforeseen accidents,[1] those results will be in my hands complete.

Now the point I want to make is this; that this work is not a thing to be taken up as scientific curiosity, or as a fad, to be done once and forgotten. The thing you need to do is, in my judgment, to make a study of the training of your teachers for this type of work, by planning a careful organization of the giving and scoring of tests so as not to interfere with the regular work, and not to add too many burdens to those the teacher already has. You want to put the measurement thru on a permanent basis, making your plans not for one year or for two years, but for a permanent institution in school organization, related to the actual work of teaching so closely that the teachers may have the use of the results for guidance of their teaching.

If we can get things on that basis, then measurements would be used to control the product, and we can have a great deal of improvement in the efficiency of teaching; but if they are used simply as a chance activity, as a thing to be done for a doctor's thesis, or something of that kind, then it will not result in any effective work.

In my lecture tomorrow I will try to show how results from standard tests can be used by teachers to modify their existing practice in the classroom; and if you get the idea as I see it, you will understand why there are six and eight and ten school systems that have organized permanent departments of educational research, so that their school work may be consistently modified year after year, on the basis of the results secured.

A brief intermission followed.

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[1] A street car strike prevented the finishing of the results in one school. The rest of the work was carried out as per schedule.

MR. MYERS: The round table is set for this time. The subject is "Limitation of Training". You will be led in this discussion by Dr. Courtis, Director of the Department of Educational Research in the Detroit public schools. After a brief statement by Dr. Courtis on the subject "Limitation of Training", the whole subject will be open for discussion. Ladies and gentlemen, Mr. Courtis.

ROUND TABLE ON LIMITATION OF TRAINING

MR. COURTIS: Mr. Chairman, ladies, and gentlemen, I am never sure that I make myself plain when I talk on this subject. In fact I am almost sure I do not, because I always find when I get thru that there are many misinterpret what I have said. I have a couple of charts here that I am going to hang up. While you may not be able to see them, yet I think the idea will be plain. I merely want to present this again for your consideration. I have put on this chart the reason for the present inefficiency, and in my judgment this is the fundamental reason why our schools are not more efficient than they are: At the present time we give practically uniform instruction to variable material.

This girl, for instance, has ability which I have represented diagramatically by ten, and this one by eight, and this one by five, this one by two, and this one by one. Now you know all children differ in their native capacity, and yet we give practically uniform instruction to all those children. As a result we get the only thing you can expect. We get a tremendously variable product. Five percent of the children, for instance, will attempt twenty-four of those addition examples I showed you, and twelve is the average score. It is possible to have them go as high as sixty. How high then shall we carry the product? How far is it desirable? My point is that there is a line somewhere in there, which I believe is located closely at thirteen or fourteen examples, beyond which it is a waste of effort to go. That is, if your training develops in a boy an addition ability which will enable him to complete, let us say sixteen or eighteen or twenty of those examples in the given time, every bit of that ability beyond fourteen is absolutely waste time put on the arithmetical drill. My point is that there is a lower limit and an upper limit, and that at the present time our products either go beyond it or away under it; and that in place of such a condition we ought to have a slightly different arrangement.

In this chart are the same children with different abilities, and this time, instead of having the instruction uniform we have the instruction graded in amount to correspond with the abilities of the children. That is, we supply variable training for variable material, and as a result we get a uniform product; in other words, it is all a valuable product. None go above this limit; no one goes under this limit. We get a product all of which is useful. That is, we get a hundred percent efficiency. We could produce those conditions, and to my mind the very greatest problem before educators today is the invention of a method of classroom administration that will permit of this kind of an adjustment for ordinary school subjects and with large classes of children. At the present time I can do it in spelling; I can do it in handwriting; I can do it in all of the mechanical elements of arithmetic; I can take a class of eighty children, for instance, and give every one individual instruction in accordance with his ability. I can allow each one to go at his own rate. I can eliminate him from the drill class when he reaches this limit. I can continue the training for the individual until he gets up at least to this limit. The limitation of training is perfectly possible under normal school conditions with large classes and many duties occupying the teacher's attention. Now how far is it desirable? How far are you superintendents and teachers willing to stand for this idea of limitation of training?

I should like to have from this conference this afternoon an expression of opinion on that matter. If you have any questions to ask, if I have not made myself clear, let us have those questions asked and answered first; or, if you have any comment to make, whether such an ideal is desirable or not desirable, I shall be glad to hear them now.

I will turn the matter over to you. I always feel this way: The minute this conference is dismissed, the minute you get by yourselves, I think everyone will have something to say about the results which you have seen. No person concerned with school work can thoughtfully review those data and not react to them. I think, in fairness to me, if you have any objections to anything I have said that you ought not to state those objections anywhere outside of this building unless you have first stated them here. That is fair, is it not?

You have heard what I have to say. Perhaps you have misunderstood what I said. My training in oral speech has not been very efficient. I find I cannot speak very plainly. People misinterpret what I say. They say I said the kind of things which I did not mean to say at all, consequently if you have any objections please let me hear them.

The following questions were then asked Dr. Courtis by various members of the conference and answered by him as follows:

QUESTIONER: What is to be done where the teacher has all she can do as it is, where her time is all taken up with her duties as things are?

MR. COURTIS: That is one of the most peculiar things I think that has come out of this whole work. I go to a teacher and I say, "Now we have decided to try this method in the system, and we have selected you to try this method experimentally." She says, "Have you seen my program? I am so rushed I don't know what to do. There is not time enough in the day now for what I have to do." "Well," I say "this matter is required; I am sorry; you will have to make this adjustment some way; will you please try it for two or three weeks?" and gradually she will give in and try it because she has to. At the end of three or four weeks she comes to me and she says, "I have five children who have already completed all the work set for the term; what am I going to give them to do?"

Now, is there no work in the school that is valuable to the individual upon which he can spend his time when he is released from this mechanical drill work? Are there no concrete definite problems which will involve initiative and development? Is there no use you can make of that time? I say the fate of the children is in the hands of the teacher. The wise teacher uses that time for work of one hundred times the value of the mechanical drill.

QUESTIONER: The question is what happens after this skill is acquired.

MR. COURTIS: It is to be used. The drill work that is going on in school is not all the work. The drill work in arithmetic is not all the work in arithmetic in the school. He is using his addition in the solution of problems. The minute that child's accuracy or speed falls down anywhere along the line he goes back in the drill class. As soon as he comes up to the standard he comes out of it. It is training for a purpose. Would not the child see then what that drill was for? Would it not serve his purpose better in the school?

I went into a schoolroom not long ago where we had given an English test. There were fifty odd children and I said to the teacher—one of the normal school cadets was in charge of the class, so that the teacher was free—"I know you have fifteen children in this class who are very good writers, whose work in writing is perfectly satisfactory. In your opinion are they getting any benefit from this drill which they are having at this particular minute?" She looked at me for a minute and she said, "I never thought of that. I don't think they are. Their writing is already perfect, and has been for a long time." I said, "Why are you giving it to them then?" She looked at me again for a moment, she shook her head, and didn't say anything. I let that go, and said, "What about these other children? Have they any incentive to improve their writing? Will they ever escape from the drill class?" Again she shook her head. That was all she could say about it. That is the situation that prevails right thru your schools if you have a class that you are running on the plan of class drills. You give the children the drill whether they are good writers or poor writers. It is simply that at a certain time you come to a place on the program where you have writing, and you have writing. Eighty children out of a hundred need that drill, and need it badly, and for those that need it, provide the drill, but *set free* the children who do not need it. Set free the children it is not adjusted for, the children that have profited by it and do not need it. The real test of the writing is in the writing in English, history, spelling, and other lessons.

The minute you have the idea of limitation of training you say to the children, "This is the product which is desired from the writing drill," and you have created a new situation. The child has something to work for. When he gets up to standard he escapes from the drill class, and the minute he takes hold of his work and begins to do this oval, not because the teacher says the time has come to do the oval, but so that he will get thru with it and break the record, you have got on his part a conscious participation in the drill. You have aroused a desire for improvement which makes the drill effective. And if the child is set free as soon as he reaches the desired degree of ability in that work, there is a chance for him to spend his time on more important work, and you have that tremendous spur on the other individuals to drill for a special purpose. It works out splendidly.

QUESTIONER: Has that ever been worked out?

MR. COURTIS: We have it in operation in arithmetic with twenty-five thousand children in Detroit. We have had it experimentally in writing. We have about fifteen hundred children trying it in spelling.

QUESTIONER: What do you do with the other children?

MR. COURTIS: There is a time in the day, for instance, when fifteen minutes is allowed for writing drill for those who need it. Those who do not need it are set free for other things. If they have a soccer tournament it is the children who get free who go out and make the arrangements for it during that time. If there is a toy to be constructed, or mechanical work of any kind, the children are free to do that work. The children who have completed the mechanical drill have the time for other things for which there is occasion.

QUESTIONER: What percentage of those set free does it become necessary to put back in the drill again?

MR. COURTIS: Not very many. Possibly one or two. After they find there is a penalty of that kind, they don't go back. The boy who completes the drill work for the term is a hero, and he doesn't like to have his laurels taken away from him and go back into the drill class again.

QUESTIONER: It is a fact that the boy who does his drill work ahead of his class can do his other work ahead of his class, too, is it not?

MR. COURTIS: Not necessarily.

QUESTIONER: Why not put him in another class?

MR. COURTIS: If you put him in a higher class you will very quickly get him into a type of work which is more abstract than his maturity and development fit him for. If you hurry a child thru the grades you get a twelve- or thirteen-year-old child into high school work, and you get him into a type of work which is beyond him.

QUESTIONER: There are things easier to say than to prove. There are children more mature at ten years than others at thirteen.

MR. COURTIS: If you can show me by any tabulation that a child twelve or thirteen years old has had the experience in dealing with other people, has had the social and sexual experience, and has had all those other experiences which go to make up the equipment which will enable him to study college history and other college subjects intelligently, why then I will——

QUESTIONER: I shall not try to do it.

MR. COURTIS: I do not think it is well to get the child into subjects that are beyond the maturity of his experiences, however able the child may be to go to the *form* of intellectual activity in those fields.

QUESTIONER: Is it not hard on those who are weaker, and never get out of those classes?

MR. COURTIS: Not at all. Here is the point of the thing. which I will try to show you tomorrow morning. The fundamental idea in this business is, to my mind, that every child has a right to have set for him, no matter what his age or grade, a task such that if he really tries to do it, he will be successful. You can measure the child before you begin to teach him, and you will find out what his ability is. If he is down at the lower end you do not set him a task he cannot reach. You set him a little baby task, and then a little larger, and a little larger task. Every child improves. If he does not gain it is the teacher's fault. It is not the child's fault.

I was interested in this chart on the wall. You have there the record of about three thousand children who were reported as failing, and the record by the teachers of the reason why they failed. The teachers said 16 percent of those children were mentally deficient. It looked very large, and we checked it back and it worked out about a standard of 2 percent. If you ask most teachers about a particular child they say he is lazy, dull, deficient, or something of that kind; but it is my personal opinion that there are many hundreds of children who are grouped in the deficient class who are really not deficient at all. There are some children whose minds are apparently so peculiarly constructed that they have just one door into them. There is a certain way of approach. If you try to approach otherwise you cannot get in. Imagine such children in the ordinary school with a teacher who is, say, a visually minded teacher, where method of instruction is entirely thru the eye. Say this child is strongly ear minded, or is motor minded, so that he understands only what he hears, or handles. You may find that all the classroom experiences are apparently meaningless to him, and you have the appearance of mental deficiency. Pile that up year after year and you finally create a mentally retarded state which is entirely real in its results but not necessary.

The other day we were trying a test on a kindergarten boy and the boy didn't follow instructions very well. The teacher said, "He is mentally deficient; he doesn't understand anything." I said, "His score in this test is all right. His fatigue factor is normal. He does not look like a deficient child. Have you tested his ears to see whether he is deaf or not?" She said "No." I said, "Do you know anything about the child at all, or his home conditions?" She said, "No." I met her about a week or two weeks after that, and she said, "I looked up that boy; and he comes from a family that is Dutch, and they talk only Dutch in the family; and the reason he doesn't respond is because he doesn't know what we say to him." How many such children do you suppose there are?

Do you see on the chart 30 or 40 percent either standing still in ability or going back while the school is trying to teach them? If you pick out any one thing, reading or handwriting, I can show you children that are being injured by the drill you give them, because they are not adapted to the drill, or the drill is not adapted to them. It is not one child, or two, but 40 or 50 percent that are standing still or going back, because you are not adjusting your methods to their particular needs.

That is why measurements are important. The time to measure is at the beginning of the teaching, not at the end. Measuring at the end is for our own satisfaction.

QUESTIONER: Then you will have a great number of classes to teach, will you not, if you try to adapt the teacher to the capacity of the child?

MR. COURTIS: Why, no, tho it would seem so. That is one of the peculiar features about the whole situation. Suppose I have a class of seventy children, and suppose also I have a series of lessons of equal difficulty,—of graded lessons in arithmetic, additions. The first day every child takes the first lesson. Those who succeed in that lesson do not need that particular drill. The second day they go on to the second lesson. Those who fail in doing lesson one evidently need to work right there. Now if you take such a group, you will find that out of those seventy children, there will not be more than four on any one day that will need the teacher's attention. That is, twenty minutes of individual work will supply the attention required by seventy children. Having helped one particular child that child will go perhaps three or four weeks before the teacher needs to help that child again. When you get a diagnosis of individual conditions you will find that all the teacher needs to do is to help, at certain spots, here and there, and by helping three or four children a day she can keep seventy children growing. But the teacher must have some means of selecting the four, and of determining the precise point at which those four need assistance. That is the function of measurement. Do I make that plain?

QUESTIONER: You would have sixteen classes a day.

MR. COURTIS: No; you do not understand me. Here are seventy people taking the drill. Out of that seventy there would be sixty-six capable of going to the next day's work without assistance. Four will need the attention of the teacher. She has to work with those four. Having helped those four, for two weeks after that they do not need attention. They will go on successfully with the regular assignment of class work; but the next day there will be four more who need attention, and the next day four more, and so forth. As a rule it will come out about that way. It may be eight on one day perhaps, and none at all the next day. But ordinarily the average teacher is able to handle all the children that need attention in a group of sixty or seventy. This is true for mechanical drill work, but not for reasoning work, not for emotional and inspirational work. In work of that type small groups are necessary.

Are there any other questions? Are you willing to accept the idea of the limitation of training? You are a very unusual lot of superintendents if you do. Are you willing to say that here is a boy who has reached an ability of twelve examples in addition; if I continue training him he will reach twenty-four by the end of the year. Are you willing to say he does not need to develop beyond twelve in addition? Are you willing to stop with his handwriting drills when you get a child up to quality twelve or better on the Thorndike scale? Such willingness must be the result of the investigations you are carrying on. Most superintendents do not see it. What! Limit a boy's training! And yet that is precisely what you are doing anyway, because if you gave your whole time to training in addition you could get a boy up to sixty or seventy examples. You are going to cut it off at some level. Why not determine the degree of ability that is essential, and having found it, define it? Notice, if you agree to that doctrine, agree that it is a desirable thing to do, then it becomes the duty of every one of you to go right back home, and, for the guidance of your teachers, write into your course of study the precise degree of ability necessary in each one of these mechanical skills, does it not?

QUESTIONER: What do you mean by ability—do you mean ability in speed or accuracy?

MR. COURTIS: Both. Speed and accuracy are two separate abilities.

QUESTIONER: What is the upper limit in accuracy?

MR. COURTIS: One hundred percent.

QUESTIONER: And what in speed—twelve out of twenty-four?

MR. COURTIS: There is no limit to human ability in speed. I have people who can do sixty of those examples in eight minutes. There is no upper limit. If you take even a mature, practiced individual and give him further special practice you can get his scores to rise. If you change the condition of practice, you will find another rise and another plateau. That thing has been done repeatedly.

QUESTIONER: Then speed must always be one hundred percent. If he solves one problem it must be with one hundred percent accuracy, and if he solves two it must be with one hundred percent?

MR. COURTIS: Because accuracy is the result of training.

QUESTIONER: Why limit their speed?

MR. COURTIS: Because their time can be used to much better advantage in other subjects than it can in developing unusual degrees of speed in relatively unimportant abilities. We are doing so much in school where the teacher does the work and the children follow. What we need is men and women who can take another man's problem and work it out; who have the power to take a problem, analyze it, get it into its elements, and solve it; how can we gain that kind of training if the teacher is always saying "Do this this way, and that that way, and the other thing the other way," if the children never take the problem and work it thru of themselves?

Suppose a boy has brought himself up to the required standard in any one of these mechanical drills; it would be perfectly possible, if you have a heating and ventilating system in your school,—take the heating in the room, for instance. Say this hall has a capacity for a certain number of boys, or people, and ask him to find out whether the heating arrangements are adequate for a room of this size, according to the standard or not. He will say he doesn't know how to find out. Tell him that is part of the problem. Suppose that he goes to steam fitters, to engineers, and to various people, gathers in that information from day to day, and simply reports each day to his teacher some progress? Would not the teacher have brains enough to judge whether he was doing it successfully or not? The drill problem is the poorest problem for him to work at. Is there not other work more important than for him to learn to add when he already does it faster than the ordinary child of his age?

QUESTIONER: Does it not depend on what he will do when he gets out of school?

MR. COURTIS: It doesn't make any difference what he does in later life, for he will have to solve problems; and the supreme thing in education, as I see it, is to teach people both how to handle a general method and how to keep their poise and balance as they are working with problems. You can gain a kind of training in working out the problem of the heating capacity of this room that is transferable to any problem you can give him to work at. You want to make the general method conscious. When a child fails, point out to him *why* he fails, if you can, and much of the difficulty is overcome. Ordinary training does not transfer, but conscious control method does transfer.

QUESTIONER: Would you regard the working out of the heating capacity required for this room a problem for a fourth-grade boy, or what kind of work would you use for a fourth-grade boy?

MR. COURTIS: No, sir; I would give a fourth-grade boy a task according to his age.

QUESTIONER: I have seen second-grade pupils do most additions, all possible additions in the second grade, with ease. Now it is not a question of brains with teachers. They have plenty of brains and they use them with pretty good effect; but I hold that that is not a valuable way of spending time, for a boy who is up with his lessons. I would think it would be a waste of time for him to run around bothering architects and engineers and bothering the laboratory and bothering himself trying to work out the heating capacity required for a room.

MR. COURTIS: I simply used that as a poor illustration.

QUESTIONER: It is a poor illustration. I want to know some of these things that the teachers in our school work can supply instead of these drills, as they are termed, to take up the surplus time. I have them do it by having them put the children in higher classes, and they do the work.

MR. COURTIS: I will tell you the kind of thing that will come in there, a real problem which they will feel an interest in. If you give him printed instructions for the making of some toy which he could use in his own play it will answer very well.

QUESTIONER: That is an old scheme that has been worked threadbare, this business of making toys, bread boxes, and things of that sort.

MR. COURTIS: If you hold him down to the making of them absolutely without help from the teacher, absolutely from his printed instructions, you will develop him in a very valuable way.

QUESTIONER: We do that at other places; in the manual training schools they do work of that kind. You are trying to lug in work that is already provided for in the course of study, and by teachers who are trained for it, and to have our teachers——

MR. COURTIS: No; I am working for a product which is not attained now by the work in the schools. There is no place now in your school where the child has the time and opportunity to struggle with a problem unaided. If he goes into the manual training schools his manual training teacher must get results, and she gives such precise instructions that she removes most of the problems involved in the task.

QUESTIONER: You are mistaken about that.

MR. COURTIS: There are many cases where that is done.

QUESTIONER: Yes; but that is not the rule. That is not generally true.

MR. COURTIS: The next step in a method of that kind would be a set of problems which could be handled in the classroom, which would be definitely related to the life of the child. If you don't like that part of it, I would say he could use his time for whatever work you would consider most advantageous to the child.

QUESTIONER: Put him in a higher class.

MR. COURTIS: No, sir: I would not accept that. I would take work in that child's life. Reading if you like, or——

QUESTIONER: But what?

MR. COURTIS: Why, anything which involves working out and using the skill which he gets in the classroom.

QUESTIONER: It is easy enough to say anything. What, for example? Don't take time to answer that; but it is using your time to poor advantage to say "anything".

MR. COURTIS: I have given you my specific answer, in my judgment. I may be wrong. As far as I have seen it work we have always found that the play element gives us a training in three or four different directions. For instance, when we were working with those fractions, I showed you that the children that completed that test were allowed to go into the school store and do actual business in the store, which was to them a gain. Now in that store they did actual work which involved the same activities as those of the drill class; and by keeping up our work correlated that way we got along without any trouble.

QUESTIONER: Do not get the notion that I am antagonistic to you. I am not. I believe in it, but I want to ask you these questions and have them answered thru you, for the questions are questions that have been submitted to me and I couldn't answer them.

QUESTIONER: Who had the oversight of these children that were permitted to go out of the drill classes?

MR. COURTIS: Those children who are able to get thru went down into the storeroom. We had one of the clerical assistants of the school, whose office was in that same room, give them some attention. They were allowed to play at that store provided they did not by their play disturb others; and the work was laid out for them in a very definite way, and they worked there without direct supervisory control; but they had the results to show. They had their sales slips, they had their accounts, they had to make things balance and bring in results. The teacher at the end of the day could look over it and see whether their work balanced, and whether it checked up with the check book. The checking was a small matter.

Another thing is in preparation for next year; as we get the children out of the drill work, we have them take up additional regular work in the subject, the optional work in the course.

QUESTIONER: Carrying that idea out in its full meaning, the same type limits would be reached in other subjects, and there would be the same variety of work to be supplied in each of those.

MR. COURTIS: Yes, but please do not misunderstand me. It is very easy to get up and talk about a thing that you are just working on as tho it were a finished product. It was not until two years ago that we discovered what was the real factor in teaching effort. Up to that time every single effort that I made to improve my own methods as a teacher made the results worse, not better. As I put on extra pressure, or extra drill on this, that, or the other thing, I made my distribution within the class widen, some children going up and some going down. It was not until we got hold of this thing of adjustment to individuals that our classes began to go together; and it was not until we got some children who were set free from these mechanical drills that we began to get results. The important problem is to work out a series of definite exercises,—toys, I should say,—which we can put into the hands of the children for them to work out as they get thru these drills, this mechanical work. Because the teachers haven't that material now, we set the children free for work on the subject on which they have the greatest need to work. It often happens they may be very poor in spelling, and they may need extra time there; if so they are set free to take the time for that purpose.

QUESTIONER: Why not allow the children to suggest what they would like to do? In many cases I think that would help out considerably. Get the boy who got his work out in shorter time than the others to suggest something he would like to do.

MR. COURTIS: There is a problem there which needs the whole of this group working on it to solve.

QUESTIONER: Would it not be natural for children to say, when they reach that standard, we will quit? Then we are confronted with the possibility that we might be putting a premium on mediocrity. The child would say, "When I get there I will quit." Don't you think there is a possibility of that, doctor?

MR. COURTIS: No; not if you see things as I do. I see the mechanical elements of school work as tools. Everybody uses the same telephone from New York to San Francisco, practically. The difference in the instruments is very slight. It does not affect the personality of the individual any. It does not make for mediocrity.

If we get everybody so that they can write and read and compute at the standard rate, and then we give them problems in which their personality will come into play we make a difference which is important. We make it possible for these people each to make his own contribution to the work of the world. The uniform product in mechanical skill is simply a means to an end. It enables people better to do their work. Now the child that can do twice as well as another in addition is not necessarily able to make any larger contribution. The real contribution comes when you work on a problem where you have a motive behind it, where you are using addition as a tool.

QUESTIONER: Carrying your plan out to its ultimate completion, it means ultimately the reorganization of our schools?

MR. COURTIS: Absolutely.

QUESTIONER: Here is one teacher who will perhaps have subjects in which she will handle seventy or eighty children, and other groups of fifteen or twenty, and it will mean practically the death of our fixed grades, will it not?

MR. COURTIS: Certainly. The grade in my judgment is a certain type of ability. A person who can do three additions in that test in addition is third-grade ability, whether he is ten or sixty years old. It does not make any difference when a person gets there. His grade will be determined by the performance which he has made.

My conception of the future school is like this: You will have a large central assembly room, like a library, in which all forms of drill work will be carried on at the same time. Each child, by proper adjustment of the work, will work on the task which is suited to him. But around that, on a lower floor, you will probably have a number of small rooms—I always think of them as educational confessionals. In charge of those rooms you will have teachers of marked ability, of special training, of higher salaries, who will handle the children one at a time, and will write a prescription for the type of work they must take in the drill subjects to overcome certain defects. Now as they get out of that drill work, as they reach certain levels, they will go to the second story where the work will be organized on the basis of the children's own interest. It will be play or work—I don't care what you call it. If the boy wants to make an electric motor and works at it six or eight hours a day in vacation, that is all right. Some people would call it play, some people would call it work. I do not care which term you apply to it. I would like school work in history and geography, and the school work in every subject, wherever there is knowledge or an inspirational element, to be of such a character that the child would take part in it because of his own satisfaction and his own interest in the work he was doing, because he wanted to do it; and for that we will have to have large laboratories where the children could enter the work in groups. There would be distinct training in the handling of such group training in leadership; and you would have all training by the direct participation of different individuals in organizing problems in handling those groups. If you could have your school on that basis the mechanical work would be largely on an individual basis, the cultural and inspirational work with small groups in charge of trained specialists who were free to do their work in the most entertaining way possible and to arouse all the emotions possible for that type of work. Then I think you would find an entirely different type of product coming out of our schools.

QUESTIONER: Suppose I say I am ready to go home and begin to write these things in my course of study for my teachers; I am not sufficiently assured right now of all the little ins and outs to know what standards are to be set; where can I get the help that I need?

MR. COURTIS: You will find in the 14th Year Book of the National Society for the Study of Education, University of Chicago Press, a list of the standards which have been set so far, and you must begin to work out standards yourself. Suppose you want to consider products for which there are no standards, you would have to make up your own type of examination, give it out to your classes, set a standard on the basis of your results, and then begin to experiment with it and see whether it was reasonable or not.

I got into this work because I tried to set standards for my own work. I set my standards away up here some place (indicating), and I reached those standards by some effort; but I fortunately came into contact with Thorndike, and he taught me to watch the scores of individuals. I found a certain group of these individuals were running this way (indicating); and I found during vacation they dropped from this high level down to about the ordinary level; and so out of that work finally came the idea that I needed to measure a larger number of people to get my standards. Certain of these superintendents have helped me get the measures of those children, so that now we know that children in this country and other countries, under a given amount of training, do about the same amount of work. Just read the tables you have from your own work here in Indiana. See how uniform those products are compared with the range of individual scores. Human nature generally has about the same ability, evidently, that is, there is probably a certain optimum ability people can reach in these mechanical skills, and the figures show very plainly that if you train beyond that you get a diminished return for your effort. If you double the time you don't get twice the result. If you treble the time you don't get three times the result. You get a diminished result, and get a larger loss during vacation. There is a certain optimum value, and that value I think is represented in those standards which we have set.

I am perfectly willing to change those standards as soon as any of you can prove that it is wise to change them. I am not going to change them blindly. I know that those speeds are the speeds at which most of the children work, and I know that further training will improve the accuracy but not the speed, at least not much. Consequently I have adopted those tentative standards for my own work, and my problem at the present time is to work out a statement somewhat like this: That one hundred hours training under such and such conditions ought to produce in the child a change in the score equivalent to, let us say, six examples. When I can state definitely what the change is, and what the elements are then I am ready to set up final standards; but until that time comes we must have something as a working basis; and that will be found in those standards in a book to which I refer.

FRIDAY EVENING SESSION

The conference was called to order by President William Lowe Bryan, Presiding Officer for the evening session.

PRESIDENT BRYAN: The teachers of Indiana are very glad to welcome Mr. Leonard P. Ayres, Director of the Division of Education, Russell Sage Foundation, who will now address you on "Making Education Definite". Ladies and gentlemen, Dr. Ayres.

MAKING EDUCATION DEFINITE

MR. AYRES: Eighteen years ago the school superintendents of America, assembled in convention in Indianapolis, discussed the problems then foremost in educational thought and action. At that meeting a distinguished educator—the pioneer and pathfinder among the scientific students of education in America—brought up for discussion the results of his investigations of spelling among the children in the school systems of nineteen cities. These results showed that, taken all in all, the children who spent forty minutes a day for eight years in studying spelling did not spell any better than the children in the schools of other cities where they devoted only ten minutes per day to the study.

The presentation of these data threw that assemblage into consternation, dismay, and indignant protest. But the resulting storm of vigorously voiced opposition was directed not against the methods and results of the investigation, but against the investigator who had pretended to measure the results of teaching spelling by testing the ability of children to spell.

In terms of scathing denunciation the educators there present and the pedagogical experts, who reported the deliberations of the meeting in the educational press, characterized as silly, dangerous, and from every viewpoint reprehensible, the attempt to test the efficiency of the teacher by finding out what the pupils could do. With striking unanimity they voiced the conviction that any attempt to evaluate the teaching of spelling in terms of the ability of the pupils to spell was essentially impossible and based on a profound misconception of the function of education.

Last month in the city of Cincinnati that same association of school superintendents again assembled in convention, devoted fifty-seven addresses and discussions to tests and measurements of educational efficiency. The basal proposition underlying this entire mass of discussion was that the effectiveness of the school, the methods, and the teachers must be measured in terms of the results secured.

This change represents no passing fad or temporary whim. It is permanent, significant, and fundamental. It means that a transformation has taken place in what we think as well as in what we do in education. It means that education is emerging from among the vocations and taking its place among the professions.

This profound change in our educational practice has not come thru the slow processes of philosophy, or because we were awakened by the stirring words of voice or pen of any educational prophet. Few school men can claim great credit for having hastened its advent. It was forced upon us, first, by the natural results of compulsory education, and still more definitely and directly by the exactions of the scientific age in which we live.

This new attitude of educators towards education means that we have ceased exalting the machinery and have commenced to examine the product. We have awakened to a startled realization that in education, as in other forms of organized activity, applied science may avail to better even those processes that have rested secure in the sanction of generations of acceptance.

The transformation now taking place in education means that it is our privilege to be part of a movement that is working changes comparable to those that are now remaking almost every form of industrial activity. The trade of bricklaying, practiced by millions of intelligent artisans, has remained almost unaltered since the days of primitive man. But scientific management steps in and asks, Why lower a hundred pounds of human flesh to pick up each two-pound brick? Why toss the brick four times to find its best face? Why tap it three times to get its proper level? Why stand in a position that requires half a dozen movements when one will suffice? And science makes answer: Build a platform for the bricks adjusted to the height of the work; lay the bricks on the platform with the best face out; mix the mortar so that one tap will suffice; and take such a position that five movements accomplish the same results that formerly required eighteen. The result is that each workman lays each hour as many bricks as he formerly laid in three hours.

Again there is the work of Mr. S. E. Thompson, who used reaction-time tests in selecting girls for the work of inspecting for flaws the steel balls used in ball bearings. This work requires quick and keen perception accomplished by quick responsive action. Mr. Thompson measured the reaction-time of all the girls and eliminated those who showed a long time between stimulus and reaction. The final outcome was that thirty-five girls did the work formerly done by one hundred twenty; the accuracy of the work was increased sixty-six percent; the wages of the girls were doubled; the working day decreased from ten and one-half hours to eight and one-half hours; and the profit of the factory was increased.

The ideals and processes of the application of the scientific method to education are in salient respects similar to those that are reshaping the processes of industry. In education, as in industry, the scientific idea is at base analytic scrutiny, exact measuring, careful recording, and judgment on the basis of observed fact. Swiftly, silently, and almost without warning, the scientific methods have invaded the educational camp and have begun to demolish the hosts of theory, legend, superstition, and tradition.

The time has already passed for us to query whether or not we shall endorse and adopt the new scientific criteria of exact measurement and judgment by results. The new method is upon us, and the question at issue is no longer "Shall we adopt it?" but rather, "How shall we utilize it?"

In dealing with the application of the scientific method to education and to industry, we must ever bear in mind one fundamental distinction. This relates to the use of time in these two sorts of activities. Time is the most important thing in the world. It is the one ever-present factor in all human accomplishment. Each thing that we do or make includes two elements: the time consumed, and the result obtained. In dealing with these two elements, the problems of education are fundamentally different from the problems of industry. In industry the tasks to be done are always definite tasks. In commerce, transportation, and manufacturing, the problem centers on the amount of time necessary to sell goods, to carry people or things from one place to another, and to manufacture articles. The result to be obtained is a constant; the time required to do it is a variable.

In the field of education all this is reversed. We have a given amount of time, and our problem is to spend it as best we can. So far as elementary schooling is concerned, this available amount of time is about eight years. It begins at about the age of six, when the child becomes comparatively independent of his mother, and extends to about that of fourteen, when physical maturity approaches. These are biological, rather than educational, facts. During these years, going to school is the normal as well as the customary occupation of children.

The distinction indicated is the reason for the striking contrast between the signal progress made in economy of time in industry, and the modest achievements in economy of time in education. In industry the results to be achieved are known, definite, and constant, while time is a variable. In elementary education the time to be consumed is a constant, while the results to be achieved are the variables.

In apportioning the eight years of childhood among the subjects of the curriculum, educators have always asked two questions. These are: "How much time should we devote to the subject?" and, "What results ought we to expect to get?"

The proposition that I wish to present is that we shall secure economy of time in education only when we realize that the amount of time at our disposal is a constant, change our inquiry from the indefinite to the definite, and instead of asking, "What results might or ought we to get?" begin to ask, "What results are we getting?" This means calling a halt on the futile quest for standards to be evolved at round-table discussions and educational faculty debates, and substituting for them methods of measurement and standards of attainment which are the products of recorded experience. If we can do that, we can lift our problem out of the field of speculation and into that of evidence.

Five years ago twenty-nine cities in America had systems of individual record cards for keeping the school histories of their children. Today over three hundred cities have adopted a uniform system for this purpose. Those cities intend to judge processes by results.

Three years ago the number of city school systems having uniform records of accounting whereby the school facts of one locality could be compared with those of another was about fifteen. Today the number of such cities is one thousand thirty-nine. Their aim is a mutual comparison of results.

Ten years ago Superintendent Maxwell of New York City published data in his annual report showing that thirty-nine percent of the school children of that city were above the normal ages for their grades. Judged by the age standards, they were educational misfits. At that time these data were almost unique and attracted widespread attention because of their revolutionary character.

Today such methods of checking up the results of our school work are commonplace.

These nation-wide changes are not products of mere chance. They have come because the public and the educators have begun to demand real information about their public schools. About seven years ago it occurred to a few people in America seriously to ask the question, "What proportion of the children who enter our common schools remain to complete the course?" This was a plain business proposition. The question at issue was the relation of the finished product to the raw material. The children who enter our public schools in the first grade are the raw material; those who complete the course and graduate are the finished product. It was an elementary question in business administration that these students were asking when they inquired what proportion of the children complete the common school course.

In order to answer this question, we must have two figures. First, the number of children who graduate. That can easily be ascertained in any school system. Secondly, the number of children who begin school each year. That cannot be obtained so easily. Incredible as it may seem, up to seven years ago school men had never thought it worth while to record that datum. A patient search showed that the cities in America recording the number of children entering school each year could be counted on the thumbs of two hands. Today the number of cities keeping such records runs into the scores.

At that time the school superintendents knew little more about the matter than that the beginners were numerous; that progress was not uncommon; and that there were some graduates each year. Now they know that in the country as a whole not one-half of the children who enter the public schools remain to graduate, and they are busily at work remaking their school systems to remedy that condition.

The startling revelation that our vaunted system of free education was failing to give even complete elementary schooling to a majority of the children evoked imperious demands for more real facts. Here were statements of educational conditions within the comprehension of all and painfully obvious in their significance. They left no room for question as to the necessity for checking up results in education.

The school children are the invested capital of the community. What should we say of a bank that kept its accounts in the same way that the school has kept account of the invested capital of society? What would you say if your banker should confess that the only facts revealed by his books were the total number of accounts handled during the year and the average monthly assets? What would you say if he should confess that he did not know and could not find out anything about the number or amount of new accounts received, old ones withdrawn, or the results of his investments?

Nor was this situation confined to elementary schools. Conditions in our higher schools were even more shocking. The relation between the pupils who entered and those who finished was startlingly small. We can hardly imagine an analogous situation in any commercial industry. What, for example, should we say of a four-act play in the theater where a thousand people were present at the beginning of the first act, five hundred got up and left before the beginning of the second, two hundred and fifty of these refused to sit thru the third, and only one hundred and twenty-five remained to see the final descent of the curtain? And yet these figures express conditions in many of our larger cities with respect to the falling out of pupils in the four years of our high school courses.

The new method which judges processes in terms of results has been by no means confined to the development of record forms and the perfecting of new devices in the statistics of school administration.

About five years ago a graduate student in one of the universities of Massachusetts tried to investigate the old problem, "What is the best age to send a child to school?" In his search for information he put the question to the head of every college department of pedagogy in this country. He received definite and positive replies from almost all to the effect that the best entering age is a comparatively late one. He then followed his first inquiry by a second in which each pedagogical expert was asked on what he based his assertion. In every case save one the answer was that the writer was positive of the correctness of his views, but had no evidence with which to substantiate them. The exception was a man who said that he knew because his own son had entered school late and had made good progress.

This happened only five years ago, and the answers were speculative and indefinite because quantitative evidence bearing on the problem did not exist. And yet so rapid is the progress that has since been made that there has been published a study of that problem based on the school histories of more than 25,000 children.

From a Michigan city there comes a striking illustration of the degree to which we as educators have enjoyed that freedom which comes thru being entirely unhampered by facts. About seven years ago a movement gained headway in that city for the establishment of kindergartens. The advocates of the proposed innovation gave as their most weighty argument the assertion that children who pass thru the kindergarten subsequently complete the elementary grades in less time than do those who have not enjoyed the advantages of such training. The faction opposing the establishment of the kindergartens denied the validity of this argument. To settle the question, the school authorities wrote to school superintendents all over the country asking whether children who had gone thru the kindergartens subsequently completed the work of the grades more quickly than did those who had not received such training. Replies were received from the superintendents of seventy-two cities. Of these, forty-nine answered that they thought that children having kindergarten training subsequently made more rapid progress than the others, but that they did not know. The other twenty-three replied that they held the opposite opinion, but that they did not know.

That result was typical of the supremacy of speculation over evidence in education. In this problem, as in other problems, opinions have varied. There has been a consensus of belief but there has been an almost absolute absence of definite knowledge. Kindergartens have been increasingly numerous in America since Elizabeth Peabody established the first one in Boston in 1868. They now exist by the thousands and on them we have spent each year hundreds of thousands of dollars. During the entire period a favorite argument in their support has been the one relied on to secure their establishment in the Michigan city, and yet until recently no one has been able to state in definite terms anything about the real effect of kindergarten training.

This situation no longer exists, for within the past three years extensive investigations have been conducted comparing the school records of many thousands of children who have had kindergarten training with the school records of the children in the same systems who have not had kindergarten training.

The new scientific method has not been confined to the investigation of isolated problems. In city after city across the country its aid is being invoked to evaluate educational results thru the medium of the school survey. Unheard of only a few years ago, these city-wide educational inquiries have been made, or are in progress, in such cities as Boston, Baltimore, Boise, Montclair, Orange, New York, and Cleveland. Already they are being planned for in other localities, and surveys embracing the systems of the entire States of Wisconsin, Ohio, and Vermont have been completed.

The progress of this educational revolution has been stoutly contested and each forward step has been greeted by an anvil chorus of opposition in which the notes ranged from the grudging admissions of the skeptic to the fiery denunciations of the educational reactionary. Always retiring and always fighting, these forces of opposition have abandoned as untenable their contention of fifteen years ago that any and all attempts at measurement in education are silly and dangerous. Having given up this position, they next took refuge in the firm declaration that while material matters in education may be quantitatively investigated, the immaterial problems of the teaching process can never be submitted to such treatment. They admitted that it would probably do no harm to discover the more important facts with respect to financial expenditures and the progress of pupils, but firmly declared that no phase of intellectual phenomena would yield to statistical analysis.

No sooner was this doctrine fully formulated than there appeared a set of scientific students of education presenting measuring scales with which to gauge the performance of the children in their classroom work. Thorndike with his measuring scale for handwriting, Stone and Courtis with their standardized tests in arithmetic, and Hillegas with his method for measuring the quality of English composition again forced the champions of tradition to retire and find a new point of defense.

Some three years ago, we undertook in the Division of Education of the Russell Sage Foundation two simple experiments in testing the social value of the subject-matter taught in our schools. The results were not conclusive, but they are most suggestive.

We had been asked to make tests of the arithmetic and geography taught in the schools of one of the large New England cities. Our experiments were confined to the work of the seventh grade. Turning our attention first to the arithmetic, we found that the work assigned for that grade was devoted mainly to measurements of space, time, content, weight, etc., and was divided into ten sections. We chose one example from each section, made from them an examination paper of ten questions, and submitted it to ten successful business and professional men in New York City, with the request that they take the examination. Those men were earning yearly salaries ranging from three to fifteen thousand dollars.

After some protest, all of them complied, and tried to answer the questions. The man who made the best record was Owen Lovejoy, secretary to the National Child Labor Committee, and he succeeded in getting a mark of twenty-five percent. We then gave the same examination to our office girl who was fifteen years old and had left the eighth A grade of the New York public schools five months before. She got seventy-five percent.

The clear lesson of this little experiment was that the schools were teaching arithmetic that had little application to the work of real life. Each man who took the examination earnestly explained that he had known all those different measures once, but that as he had never used them, they had slipped from memory. Two of the questions related to the purchase of paper in wholesale quantities, and of the men who took the examination one was the business manager of a great national magazine, while another was the president of one of our foremost book publishing houses. Both of those men purchase tons of paper every year, and both failed on those two questions and protested that the terms used in them had been obsolete for half a century.

For testing the geography, a different method was tried. The work assigned by the course of study related in the main to Africa and South America. A tabulation of the amount of space devoted to the two countries by the textbook in use showed that Africa was given twice as much attention as South America. This suggests the query whether or not the Old World continent is more important to Americans than the New World continent. As a step toward answering it, figures were secured from the federal government showing the amount of commerce in exports and imports between our country and each of the continents. These figures show that the bulk of our commerce with South America is about eight times as much as it is with Africa.

As a second test, two press-clipping bureaus were asked to send us for the space of two months news articles and editorials dealing with either continent, and collected from publications printed in all parts of our country. The result was the collection of something like a bushel of clippings. When these were tabulated, it was found that those pertaining to South America were several times as numerous as those about Africa.

The result of this investigation was to show that there existed only the remotest relation between the amount of teaching devoted in that school system to the continents and their countries, the frequency with which the ordinary citizen finds references to them in current literature, and the amount of business that we, as a nation, do with them.

More recently we have conducted another test quite unrelated to those just described. It consisted of a study of the spelling vocabularies of two thousand business and personal letters. The results showed a striking discrepancy between the list of words used in the letters and those found in our school spelling books. More than two-thirds of the words in the National Education Association spelling lists did not appear even once in the tabulations of the words of these two thousand letters written by two thousand different people.

A study of the penmanship of children in the final grades in different cities shows that at the end of eight years of schooling children in some cities are able to copy simple written matter at the rate of five words per minute, while in other cities children copy the same material in fully as high a quality of handwriting at the rate of twenty words per minute. Moreover, these discrepancies are found to exist between cities where the time devoted to the teaching of the subject is approximately the same. These are data from which satisfactory results may be distinguished from unsatisfactory ones. The new method of judging handwriting by measuring the work of the children is not so easy as the old method of doing it by discussing the methods of the teacher, but its results are far more definite.

In applying this method, we must keep uppermost in mind the fundamental principle that great economies are effected thru small savings. The change which effects a saving of thirty-five minutes a day results in economizing one year of school life out of the eight-grade course. The change which saves three and one-half minutes per day means the saving of one school month during the course. It is the small changes that produce the big results.

No claim of finality or completeness can be made for these obviously inadequate tests of the social value of the arithmetic, geography, and spelling taught in our school systems. What has been presented is offered merely as illustrative of the sort of tests which might be made to evaluate the social utility of some parts of the subject-matter taught in our public schools.

The final citadel in which the old guard is now making its last stand consists of the objection that the most important elements of true teaching can never be measured.

They assert, and they are right in asserting, that we can never determine by mathematical measurement the degree to which the strong man and the noble woman influence for good the characters of their pupils. But what they overlook is the fundamental truth that in education, as in other pursuits of life, character and efficiency go hand in hand. As school executives make practical application of the newer scientific tests, no fact stands out with more impressive distinctness than that the teachers whose classes make the best records are the teachers who are the most truly successful in the shaping of character.

There remains one other objection, less frequently advanced but sometimes voiced, and that is that the advocates of the scientific method aim to reduce all work in education to the dead level of uniform precision. This charge is born of a complete misunderstanding of the ends, aims, and processes of the new method. Its aim is not uniformity but individual development. The measured beat of the concert recitation is not music in the ears of the scientific students of education. The sight of a rigid row of reciting children with toe tips nicely adjusted to a line painted on the classroom floor does not cause their souls to leap in admiration. Their ideal of school discipline does not consist of having a roomful of growing children accomplish the amazing feat of sitting thru an entire period without moving a muscle or winking an eye. Their ideal of educational administration does not contemplate a uniform country-wide daily program by which each recitation period in every city and hamlet shall be fixed by a master clock located at the seat of the national government in Washington.

The object of the new method is the substitution of evidence for opinion and knowledge for speculation. Its champions are working to develop measurements in education because they realize that only by this method can education become an art and a science, and its practice be changed from a vocation to a profession. They scan the history of science and remember that thru the development of measurements astronomy grew out of astrology, chemistry emerged from alchemy, and physics developed from mystery.

They read the history of education and realize that the astonishing progress of the past decade has come from shifting the form of inquiry from asking, "What results can or might we get?" to "What results are we getting?" This makes the pupil and not the teacher the center of interest. It calls a halt on the futile quest for standards of attainment on which we have never come to an agreement, and aims instead to discover units of measurement. Simple as it sounds, this change from asking, "What results should we get?" to "What results are we getting?" is the keynote of the whole scientific method in education. To answer the question in its new form means the development of units of measurement, and when these are secured, the standards of attainment will work themselves out automatically.

The certainty about the scientific method in education is that it is with us. That it will develop enormously in the immediate future is entirely sure. What its effects will be we can as yet only surmise. The dangers involved are as real and imminent as the advantages are self-evident. These dangers will arise from the mass of superficial and erroneous results that will certainly be presented to the educational world in the guise of scientific contributions to applied pedagogy. What is to be our attitude toward each new contribution?

My own answer is that we must welcome them all, but challenge them all, and attempt to verify them all. Every figure, every process, and every conclusion, whether presented by the educational expert or the novice, must be submitted to the most rigid scrutiny and searching analysis before being accepted as worthy of inclusion in the new pedagogy.

In proportion as we are thus enabled to retain the genuine and to reject the spurious, education will move forward among the other sciences. Its new methods will substitute knowledge for speculation and evidence for opinion. Its marshaled facts, expressed in definite terms, will demolish the hosts of legend, superstition, and theory.

Under the new régime the studies to be included in the curriculum and the methods by which they are taught must have a more valid reason for being than the fact that our forefathers had them in their schools.

"How much?" and "How many?" and "With what results?" are going to displace guess-work, imagination, and oratory as criteria for shaping educational policies. The old method has been education within the sheltering walls of the cloister in which an occasional peep-hole has been cut to satisfy the parents and silence the taxpayer. The new method proposes education in the open and under the clear and penetrating rays of the searchlight.

SATURDAY MORNING SESSION

The session was called to order by Linnaeus N. Hines, Superintendent of the Crawfordsville schools. He introduced Associate Professor H. G. Childs, of Indiana University, who read a paper on "A Brief Survey of Problems in the High School Field".

A BRIEF SURVEY OF THE PROBLEMS IN THE HIGH SCHOOL FIELD

MR. CHILDS: Mr. Chairman, ladies, and gentlemen: The two most significant factors in the educational situation at the present time are: first, the unprecedented growth of the high school in attendance, teaching staff, expansion of the courses of study, and equipment; and secondly, the rapid spread of the movement having for its object the measurement of educational achievement, the standardization of educational plants, equipment, and products.

Statistics from the reports of the U. S. Commissioner of Education, combined with estimates for the past year, indicate an increase in high school attendance of about one hundred and fifty percent since 1900. It is estimated that during the present year about thirty percent as many pupils entered high school as entered the elementary school. In 1900 the proportion was about one to ten. Never before have the people of any nation appreciated the possibilities of secondary education as do the American people at the present time. The extensive modification of high school courses of study in the past fifteen years, especially the introduction of the social sciences, commercial subjects, and the practical arts, has been a potent factor in high school growth thru its appeal to popular imagination and to the individual needs and interests of children.

The cost of secondary education has increased even more rapidly than attendance itself, and the public, tho generous in its expenditures, is beginning to demand an accounting—a justification for these ever-increasing outlays. Nor are these public demands unreasonable when we find from reliable data that in two cities of the same size in adjoining States, where about the same social and industrial conditions prevail, the one is paying $97.55 per pupil for secondary instruction and the other $25.47. To be sure we do not know that these outlays represent the same quality of service to their respective communities, but on careful investigation we should probably find but little difference in quality of instruction, courses of study, percent of population in attendance, educational mortality, etc. There is clearly need of establishing standards.

I shall be able in the brief time allotted me to mention only a few of the investigations and experiments that have recently been undertaken in the secondary field.

During the winter term of this year I spent about ten weeks in high school visitation, which included a hasty inspection of about forty high schools, mostly those belonging to the North Central Association. In, perhaps, one-third of these schools the principal was conducting some form of experimental or statistical investigation. As a rule these investigations were undertaken entirely as a local problem and when completed were of limited value because of lack of standards of comparison.

In three or four schools I found the distribution of teachers' marks under consideration; in two or three, unit costs of instruction; in two or three, an attempt to solve the problem of directed study either by increasing the number of forty-minute periods—to nine in one school—or by lengthening each of six or seven periods to sixty minutes each and dividing the time of each class about evenly between recitation and development and study of new work; in a few cases age-grade tables had been constructed, but very little seemed to have been done to determine causes of failure and withdrawal; in only one school did I find an organized course in vocational information, tho there are two or three other schools in the State doing such work. In one school I found the teachers of the eighth grade using the Hilligas scale in an endeavor to establish standards of achievement in English composition and to improve the quality of the work as measured thereby; in several schools a reorganization is being effected in the seventh and eighth grades, to include these grades in a six-six plan, a six-three-three plan, or a six-five plan, or a seven-four plan, in the latter case omitting the eighth grade entirely.

All of this experimentation is good, but in order to have the greatest value it must be carried on coöperatively under the same conditions and the results be brought together for purposes of comparison. At the present time the High School Principals' Association, thru its research committee, is coöperating with the Department of Secondary Education of Indiana University and the Bureau of Coöperative Research in an investigation of high school attendance, acceleration, retardation, failure and its causes, repeating, elimination and its causes, promotions, etc. The blank forms for this investigation will be sent out next week to all paid-up members of the Principals' Association and a liberal response is anticipated. Next year, I trust we shall be able to coöperate in the testing of achievement in composition or algebra, and also to have several schools work out unit costs of instruction. I should personally like to see six or eight schools undertake various plans of organization for directed study.

I have here three or four charts summarizing some phases of cost of instruction and relative offerings in different subjects in the high school at South Bend, which I am exhibiting with Superintendent Montgomery's permission. I should add that this investigation was made by Mr. Osborn, a teacher in the South Bend high school, in preparation of his master's thesis, and that since the study is not yet completed, the results as set forth in these charts are to be considered as only tentative. I should also add that these figures are based on average daily enrollment and not on total enrollment, and that this, of course, makes the cost per pupil higher. The complete study will show the results on both bases.

At a time when new courses are being developed and the public is beginning to question both costs and values, we need to make serious studies of this sort. As a result of a similar investigation made by Superintendent F. E. Spaulding, formerly of Newton, Mass., Greek was dropped for the first time from the Newton high school on the ground that the high cost due to the small number of pupils choosing it was not justified. So that, as we consult this chart (Fig. 24, Cost) and note the wide differences in the cost of two credits each in music, English, and manual training, the question arises "Do two credits in each of these represent equivalent values? If so, should we pay such widely divergent sums as $1.90 and $29.50 for equivalent values?"

The second chart (Fig. 25) shows the composite ingredients of the average high school pupil's program of work. This, in conjunction with a vocational survey of the city and a study of the occupations entered by high school graduates, should indicate whether or not the high school offerings are suited to community needs.

In every subject of the many schools I found within any one subject a very great diversity as to quality of instruction, quantity and quality of equipment, and even of cost of apparently the same equipment, and standards of achievement in general.

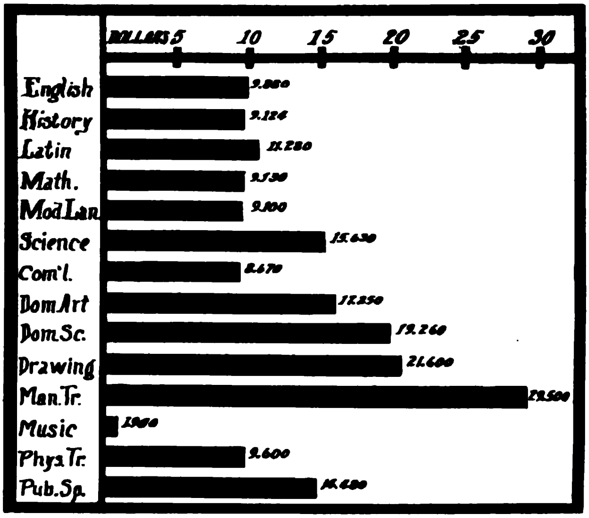

FIG. 24. COST OF ONE YEAR'S WORK, OR OF TWO CREDITS, IN EACH SUBJECT IN THE SOUTH BEND HIGH SCHOOL, FOR THE YEAR 1913-14 (APPROXIMATE)

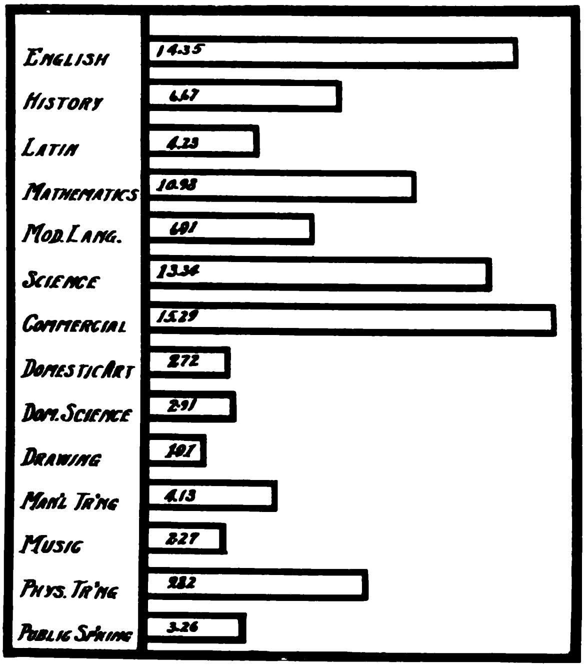

FIG. 25. COMPOSITE INGREDIENTS OF THE EDUCATION OF THE AVERAGE HIGH SCHOOL PUPIL IN THE SOUTH BEND HIGH SCHOOL, EXPRESSED IN PERCENTS

I believe the State Department would do a good work to prepare and send out, to every high school, standards for the following: size of classrooms for from twenty-five to thirty pupils; size of laboratories, manual training, cooking, sewing, and commercial rooms for from twenty to twenty-four pupils; desirable equipment for each subject, laboratory, etc., as to quantity, quality, and cost.

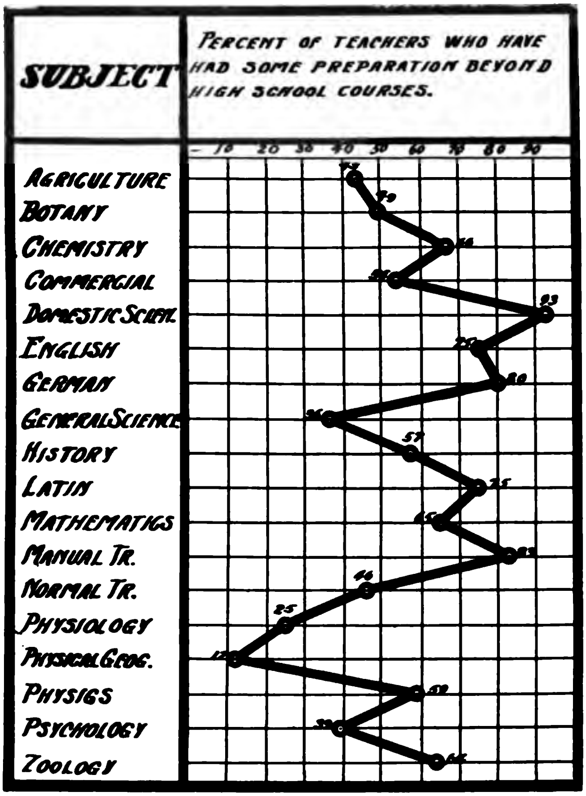

FIG. 26. CAUSES OF INEFFICIENCY: LACK OF PREPARATION OF TEACHERS. (BASED ON DATA FROM KANSAS HIGH SCHOOL SURVEY, 1914)

These charts explain why much of our high school teaching is not more efficient. [Here the speaker referred to charts from the Kansas High School Survey on Tenure of Office and Amount of Preparation.] The data relative to the tenure of teachers indicate that 786 of the 1,580 high school teachers included in the survey were serving their first year in their present positions, and that 392 were serving their second year.

When one-half our teachers change positions every year and three-fourths within two years, it is impossible for them to have taken root in the school and community life so as to have reached a high degree of professional efficiency. Lack of preparation, as shown by this chart (Fig. 26) is, perhaps, a still more potent factor contributing to a low state of efficiency. How vital do you expect physical geography teaching to be where eighty-eight percent of the teachers of this subject have had no courses beyond the meager ones offered in eighth or ninth grades? It is a case of trying to slake the thirst from a dry spring. Fifty-one percent of teachers of botany have had no botany training beyond high school courses, mostly in the ninth grade. But fifty-seven percent of history teachers and sixty-five percent of mathematics teachers have had training beyond high school courses. Do you wonder at the high educational death rate in our high schools?

State legislation requiring at least two years of collegiate training and ultimately a full college preparation for all high school teachers is greatly to be desired. But whatever the degree of teacher training the most vital teaching will be done in those schools in which definite provision is made for growth while in service. This is a problem of real supervision of which there is all too little in the secondary field. Certain superintendents present at this conference have told me that perhaps the greatest benefit accruing from their attempts to measure achievement along certain lines by means of standard tests has been in the keen interest and intelligent insight awakened in the teachers taking part in these experiments, or as one man put the case, "The use of these tests has been my most effective means of supervision."

The three speakers who are to appear next on the program represent different phases of experimentation and service which the University, thru the School of Education and the Extension Division, is trying to carry out in furtherance of the educational interests of the State, particularly in the secondary field.

MR. HINES: We will hear next a paper on "Possibilities in Consultation Work with History Teachers", by O. H. Williams, Assistant Professor and Critic Teacher in History, Indiana University.

THE PROBLEM OF CONSULTATION WORK WITH HISTORY TEACHERS

MR. WILLIAMS: Mr. Chairman, ladies, and gentlemen, I desire to suggest a slight change in the statement of the subject assigned me. I do not wish to appear in the rôle of an advocate or a propagandist. I am not attempting to make a case for consultation work, but rather to define its function and explain its essential nature. In place of the possibilities, I prefer to speak of the problem. My theme, then, shall be, "The Problem of Consultation Work with History Teachers".

1. *What is consultation work?* A phase of educational activity so recent in its inception requires careful delimitation. What is its real nature? What is its place and function in the complex system of organized educational work? What relation does it bear to the general subject before this conference?

Viewed from one side, consultation work is a refined and specialized form of the school survey. It *is* the school survey applied in an intensive way to one of the school subjects. But it is also something more. It seeks not only to evaluate conditions and detect inefficiency or point out excellences, but it also aims to supply vision and stimulus for teachers in the everyday teaching of history. It is therefore an expert form of directed supervision. But it is even more than this. It not merely scrutinizes conditions as they are and attempts to apply remedies where needed, but it probes deeper and searches for fundamental facts and processes in the teaching of history. It is, in a word, a unique species of educational research. Its ultimate end is to reduce the teaching of history to a strictly scientific and fundamentally correct basis. Its laboratory is found in the Critic School, and its final tests and applications are made in all of the schoolrooms in the State.

2. *What is the problem of consultation work?* Its problem is fourfold:

(*a*) To study intensively actual conditions in the organization and teaching of history thruout a system of schools. This it does on the ground by visitation and observation of class instruction, conferring with teachers and supervisors, and surveying the facilities and equipment for work.

(*b*) To help the teachers to discover and utilize their own resources and those which lie close at hand. This it accomplishes thru personal consultation and group conferences, and by exhibits and demonstration lessons and exercises.

(*c*) To organize and direct the teachers of history in the coöperative study of their problems and in constructive work in their field. This is achieved largely by a selected group of representative teachers, working in coöperation with supervisors and administrative officers, in a common attack upon some such problems as the history course, the supply of material resources, plans for vitalizing history work and adapting it to children in the various grades.

(*d*) To gather, analyze, and disseminate facts bearing upon the social values of the subject, such as are found in the attitudes of teachers and students toward it.

3. *How may history consultation be expected to function in these different ways?*

In the first place, it makes a survey of the history work thruout a system of schools. It starts with facts and conditions as they are. It studies closely (but withal sympathetically) the history instruction thru grades and high school, with special reference to the quality, spirit, and method employed; it views the entire course of study in history, with respect to the plan, organization, materials, and relations with other subjects in the program; it looks into the resources, visible and invisible, which are at the command of the teachers. All these factors consultation service evaluates and judges in the light of educational theory and practice and of desirable social aims and standards of work.

It should be noted that consultation, such as we have here in mind, does not indiscriminately sweep into the scrap-heap the work of teachers, the plans and organization of supervising force, or the equipment supplied by the administration. Rather it is as diligent and enthusiastic in finding and conserving excellences as in condemning and eradicating deficiencies. In fact, it is more vitally concerned with the discovery and conservation of the best work than with the exploitation of what experience and experimentation have demonstrated to be poor work. One case may serve to illustrate. While engaged in consultation service early in the present year, the writer found the opportunity to study some really excellent teaching by a group of teachers in the lower grades of a certain city. The work of adapting history to children's interests, of relating the facts of history to the lives of the pupils, of stimulating and interesting presentation thru visualized and concrete forms, simple dramatization, and constructive exercises, had been stressed by the supervisors with the help and guidance of the school superintendent. This work was commended, redirected in one or two particulars, and passed on to other groups of teachers in other systems of schools.

Yet to be of real value, a consultation service should apply well-defined standards and rather severely condemn those features in the work which fall below the requirements. The hopeful and encouraging element in the situation is to be found in the cordial and genuine welcome given by school superintendents and supervisors to the careful analysis and close application of the knife. This analysis and evaluation of the conditions is made in part upon the spot, and more comprehensively in the written report to the school authorities.

In the second place, consultation of the right sort will help teachers to discover and put to account their own resources and those which lie unused at ready command.

In the matter of materials, for example, for use in the lower grades, the choicest stories and instructive bits of human experience,—rich in social suggestiveness and extremely well-adapted to younger children,—lie concealed in the local pioneer traditions in which every community abounds. How to bring them to the light of day, how to clothe them in attractive garb, how to use them in an effective way, is a problem beyond the ken of most teachers in the public schools, if they be not directed by expert and experienced hands. For most teachers, the treasure-house of community history remains double-locked. The rich stream of local life lies untapped.

Again, for advanced grades, a vast reservoir of reading and illustrative matter lies ready at hand, but still undiscovered by the rank and file, in the publications of State and federal governments. Maps, pictorial collections, monographs unexcelled in authenticity, illuminating reports, are but a few of the many sorts of resources which may be had almost for the asking.

In the matter of fundamental aims and points of view, the history teacher is often, indeed usually, quite at sea. She is like a mariner without chart or compass. All too rare is the teacher who has acquired the fine art of relating historical instruction to the life and conditions of the present day. One of the fundamental defects in the teaching of history, as observed by the writer over and over again, is the failure to do this very thing. Much, indeed most, of the history course pertains to times and conditions remote from our own. It is simple enough for the teacher to fall into the easy, academic, textbook fashion of teaching history. But to trace connections between the life and culture of past times and of the present; to establish parallels and make fruitful comparisons; to illuminate contemporary social, political, and economic questions with the light of past conditions, is not so easy or simple. All too few are the teachers of history who are thoroly imbued with the social point of view. Herein lies one great opportunity of the consultation service. By stressing the point of view, by citing numerous and concrete illustrations of vital history teaching thru articulations with present-day conditions, by pointing out failures to make such connections, by demonstration of the stimulating effect upon children's interest when such connections are made, one of the most valuable services may be rendered to teachers of history.

As for standards whereby teachers may judge the quality of their own work, and in some measure test its effectiveness, they are usually even less clear and certain than in relation to the point of view. If standards of value are set up, they are given new resources within themselves whereby to pass judgment upon their own work, to evaluate it properly, and to bring it to higher degrees of efficiency. History consultation finds here another opportunity no less important than the one just mentioned. It should have well-defined teaching standards,—not merely the general quality standards of provision for organization, motivation, initiative, and appraisal of values,—but the more essential history standards of training the historical judgment, interpretative power, and concreteness of detail, as well as the application of historical knowledge.

In the third place, history consultation should seek to organize and direct the teachers in concentrated study and coöperative activity looking to the betterment of the history work thruout their schools. It should, in a word, not only afford teachers a new vision of their work, and place a value thereon, but it should set in operation the forces for redeeming the situation.

This may be brought about by securing coöperative effort on the part of the school administration, the supervisory staff, and the teaching faculty. Whatever work of reconstruction is undertaken, the teachers should themselves have a large and important share in accomplishing it. A representative group of teachers should be selected, including those who have had special training in history and those who have a natural regard for the subject. This group may subdivide their work, one portion to plan or reconstruct the course of study, another to consider the material needs and the best mode of relating the subject to the community interests.

Such a committee of teachers (and principals) is not only likely to develop a superior plan of work, but in the process of doing so to catch the spirit of the course, a spirit readily communicable to the entire teaching body.

Finally, consultation service has the highly important function of collecting, analyzing, and giving out for the common good facts bearing upon the real and assumed values of the subject. Of all forms of directive supervision, this needs most to be anchored to solid earth. Whatever in theory or practice is accepted as good must find approval in the common experience of teachers and supervisors, of pupils in the schools, of students of education, and of persons in all of the walks of life. The test of experience, we believe, must be the final criterion for judgment of values in history as in other school subjects.

It is the function of this work to consult in the most economical and scientific way the largest possible group of persons concerned. As an instance of what may be accomplished in this way, let us note the results of two letters of inquiry recently sent, one to the teachers of history and principals of the commissioned high schools of the State, the other to recent graduates of these high schools, viz., to college freshmen.

Now, the really important subject which is engaging the attention of high school teachers of history is that of needed readjustments in the course of study. Many excellent teachers have long felt that the prevailing program in history and civics for high schools is ill-balanced and ill-adapted to twentieth-century social and industrial needs. The arrangement, for example, whereby one-third of the time in a three-years' program is given to ancient history is a poor distribution of work. The ancient world, they say, has important bearings upon the modern, but its essential features may well be treated in a half year. Much of the subject material taught in the full year of ancient history, so far as social value is concerned, is the veriest rubbish. Its mastication and digestion by red-blooded boys and girls is effort worse than wasted. Yet twice as much time is devoted to ancient history as to modern Europe, or to either American history or to civics. As a result, our youth are leaving the high schools without real understanding or appreciation of the factors which have made the Europe of today, or of the social and economic problems which face the American people. So much for the belief of these teachers in the fore-front. What is the consensus of opinion which is born of experience of students and teachers thruout the State? Let us first view the analysis of the replies from the principals and teachers. The nature of the questions submitted is sufficiently indicated in the detailed replies which follow:

I. REPLIES FROM HIGH SCHOOL PRINCIPALS AND TEACHERS OF HISTORY

A. From all schools.	Number		% of Total	
1. Total schools addressed	441	...	100.0	....
Total schools responding	...	212	....	48.0
Total schools not responding	...	229	....	52.0
2. Total responses received	290	...	100.0	....
Total from teachers	...	120	....	41.3
Total from principals	...	161	....	55.5
Total from superintendents	...	9	....	3.2
3. Facts indicated by replies.	Number			
a. Courses of study.	Schools		% of Total	
*Standard three years	183	...	86.3	....
None required	...	6	....	2.8
One year required	...	68	....	31.6
Two years required	...	30	....	14.1
Three years required	...	71	....	33.4
Not stated	...	8	....	3.7
*Standard four years	9	...	4.2	....
None required	...	2	....	0.9
One year required	...	5	....	2.3
Two years required	...	2	....	....
*Non-standard courses	20	...	9.5	....
Two years' course	...	7	....	3.3
Three years' course	...	9	....	4.2
Four years' course	...	4	....	1.9
Total on courses of study	212	212	100.00	...
b. Satisfied with course.	Number		% of Total	
Yes	...	220	....	75.8
No	...	67	....	23.1
Not stated	...	3	....	1.1
Total	...	290	....	100.0

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*Standard courses are the three or four "blocks" recommended by the Committee of Seven, viz., ancient, medieval and modern, and American and civics (3 years), or ancient, medieval and modern, English, and American and civics (4 years). Non-standard courses are all other combinations.

c. Value of fields offered. (Total replies, 290.)

Field	Least Value	Most Value	% L. V.	% M. V.
Ancient	149	13	51.3	4.4
Medieval	47	3	16.2	1.0
Industrial	7	1	2.4	.3
American	6	76	2.0	26.2
American and Civics	0	92	.0	31.7
Civics	4	22	1.3	7.5
Modern	1	26	.3	8.9
Medieval and modern	5	8	1.6	2.7
Not stated	71	55	24.4	18.9

d. Preference of fields. (Total replies, 290.)

Fields	Number	% of Total
Ancient	80	27.5
Modern	209	72.0
Not stated	1	0.5
Industrial history	74	25.5
Economic emphasized	172	59.3
Not stated	44	15.2
Civics separate	121	41.7
Civics correlated	163	56.2
Not stated	6	2.1
English	131	45.1
European	93	32.0
Not stated	66	22.9

c. Should a syllabus be prepared?

Yes	196	67.5
No	43	14.8
Noncommittal	51	17.7

B. From larger schools. (In cities and towns of more than 2,000 population.)

1. Total replies received	136
2. Total schools responding	84

3. Facts indicated by replies.

	Number	% of Total	
a. Enrollment of pupils.	(First Sem. 1914-15)		
Total in 84 schools	24,126	100.0	....
Total in history classes	11,842	49.0	....
Total in ancient history	4,315	....	36.4
Total in medieval and modern	2,597	....	21.9
Total in American and civics	2,894	....	24.4
Total in English history	364	....	3.0
Total in industrial history	726 (est.)	....	6.1
Total in civics alone	332	....	2.8
Total in economics	65	....	0.5
Total in general history	49	....	0.4

b. Courses of study.	Number Schools		% of Total	
Standard three years	...	65	....	77.3
None required	2	...	2.3	....
One year required	31	...	36.9	....
Two years required	10	...	11.9	....
Three years required	22	...	26.1	....
Standard four years	...	7	....	7.0
None required	1	...	1.1	....
One year required	3	...	3.5	....
Two years required	3	...	3.5	....
Non-standard courses	...	12	....	15.7
Two years' course	1	...	1.1	....
Three years' course	7	...	7.0	....
Four years' course	4	...	4.6	....

c. Satisfied with course. (136 replies.)

	Number	% of Total
Yes	98	72.0
No	35	25.7
Noncommittal	3	0.3

d. Value of fields offered.

Field	Least Value	Most Value	% L. V.	% M. V.
Ancient	69	13	50.7	9.5
Medieval	20	1	14.7	0.7
Industrial	9	1	6.6	0.7
Medieval and modern	12	8	8.8	5.8
Modern	4	18	2.9	13.2
American	5	37	3.6	27.1
American and civics	0	45	0.0	33.0
Civics	2	14	1.4	10.2
English	2	4	1.4	2.8
Noncommittal	23	16	16.9	11.6

e. Preference of fields. (Total replies, 136.)

Fields	Number	% of Total
Ancient	35	25.7
Modern	92	67.6
Noncommittal	9	6.7
Industrial history	28	20.5
Economics emphasized	70	51.4
Noncommittal	48	28.1
Civics separate	59	43.4
Civics correlated	64	47.0
Noncommittal	13	9.6
English history	60	44.1
European	58	42.6
Noncommittal	18	13.3

f. SOME TYPE COURSES SUGGESTED IN REPLIES

9th Year	*10th Year*	*11th Year*	*12th Year*	*Number*
Anc. 2	Med.-Mod (to 1700)	Mod. 2 (1700 to date)	Am. 1-Civ. 1	1
Anc. 2	Med. 1-Eng. 1	Mod. (inc. Am.)	Civ. 1-Ec. 1	1
Anc. 2	Med. 1-Mod. 1	Eng. 1-Am. 1	Civ. 1-Ec. 1	2
Ind. 2	Med.-Mod. 2	En. 2	Am.-Civ. 2	2
Anc.-Med. 2	Mod. 1-Eng. 1	Am. 2	Civ. 1-El. Ec.	1
	Anc. 1-Med. 1	Eng. 1-Civ. 1	Am. 2	1
	Anc. 1-Med. 1	Mod. 1-Am. 1	Am. 1-Civ. 1	2
	Anc. 1-Med. 1	Mod. 1-Eng. 1	Am. 1-Civ. 1 or Ec. 1	13

We shall next examine the results obtained from the letter of inquiry addressed to college freshmen. These results are partial in their nature, being confined to the replies received from the freshmen at Indiana University and Franklin College, and to the one point of attitude toward the various fields of history.

II. REPLIES FROM COLLEGE FRESHMEN

1. Total replies examined 246
2. Facts indicated by replies.

a. Value and interest of fields. (Total replies, 246.)

Fields	Most Value	Least Value	% M. V.	% L.V.
American	131	18	53.2	7.3
Civics	51	9	20.7	3.6
English	17	8	6.9	3.2
Medieval and modern	12	12	4.8	4.8
Modern	14	14	5.6	5.6
Medieval	11	57	4.4	23.1
Ancient	43	114	17.4	46.3
Not stated	8	23	3.2	9.3

b. Attitude on leaving high school. (Total replies, 246.)
Total desiring to:

	Number		% of Total	
Pursue the study	133	...	54.0	....
Leave off study	113	...	45.9	....
Positively avoid	...	63	....	25.6
Neutral	...	50	....	20.3

MR. HINES: The next speaker will be Mr. C. E. Montgomery, Critic Teacher in Botany, in Indiana University. His contribution is entitled "The Botany Situation in Indiana High Schools".

THE BOTANY SITUATION IN INDIANA HIGH SCHOOLS

MR. MONTGOMERY: Many teachers, both in colleges and high schools of Indiana, have long felt that the teaching of biology is not accomplishing the results hoped for. Various reasons have been given for this failure, but until the present there has been no body of facts upon which anyone could base statements regarding science criticisms.

In February, 1914, one hundred and fifty sets of a questionnaire were sent to as many commissioned high schools of the State. Only the best high schools were included because it was considered perfectly safe in assuming that conditions in the lower grades of schools were at least no better. Of those sent out sixty-eight were returned more or less carefully answered. In making the questionnaire only two factors in the work were thought to need investigation, the teacher and the course of study. The child indeed should not be left out, but in this case he was looked upon as a constant, and therefore not subject to a large number of variations.

The demand that teachers employed in the better high schools be college graduates is being fairly well met. Of the sixty-eight reporting, nine teachers hold master's degrees, thirty-six bachelor's degrees, and seventeen are normal graduates. Six did not report. However, the mere fact that a teacher is a college graduate, or nearly so, does not mean that he or she will be a successful instructor in all lines of work. The teacher with the college diploma and one year or less of botany to his credit is not necessarily any better, if as good, a teacher of botany as an undergraduate equipped with a much wider knowledge of the subject.

The following figures show to some extent the preparation in subject-matter of those teachers handling botany in these schools: Twelve are "majors" in botany, five in zoölogy, four in mathematics, four in history and economics, five in English, eight in physics, seven in chemistry, four in German or Latin, two in philosophy, two in education, six in agriculture, horticulture, and other practical sciences, and nine did not report. These figures show that about eighty percent of the teachers handling botany in our better high schools are primarily interested in some other kind of work. This condition is emphasized more fully by the following data: Eight teachers report less than one year of botany work, fifteen from one to two years, three from two to three years, and fourteen from three to four years. Twenty-six others give general science and biology for their scientific training. It is quite generally conceded that to handle high school botany in anything like an efficient manner, one must have at least two years of college work in this line. As facts show, just about twenty-five percent of the teachers of this work in our largest and best equipped high schools can meet such qualification.

If the lack of preparation in subject-matter were the only shortcoming of botany teachers, the status of teaching would not be so grave. If these teachers understood the organization and method of the subject, the besetting difficulties would be more easily alleviated. Forty-nine of these teachers have had no work in education, and nineteen report from twelve to twenty-four weeks' work in learning how to teach botany. Even for those who have a sufficient grasp upon the subject-matter, the organization and manipulation of botany work in the high school often prove a serious stumbling-block. Many teachers fail to get the best results simply because they do not understand how to operate the machinery to the best advantage. Adding to the above deficiencies, the complaints of too much work, too short time, etc., it is seen that there is much room for improvement in respect to the teacher's own equipment.

In these sixty-eight Indiana high schools, botany seems to stand out strongly as a freshman science. Forty-eight schools give it in the first year, eight in the second, two in the third, and two in the fourth. Forty require botany for graduation and seventeen make it elective. From these facts one of two things seems evident: either school authorities consider botany very much worth while, or it is the cheapest and most easily handled science for high schools. It is sincerely hoped that the former is the impelling motive. Various teachers gave the following estimates as to the value of high school biology: Twenty say it prepares for other sciences, nine say it trains observation, eight think it brings the child closer to nature, fifteen feel that it is very important, nine say it is educative, six get appreciation from it, five say it gives valuable knowledge, one thinks it can help solve the sex problem, and three say it is of no value as taught at the present time. Some of these answers are to the point, but the others simply show that teachers have no good notion of what botany may do for the child. Before the botany work of our high schools can approach any nearer fair results, it is essential that instructors understand definitely and clearly the mission of biology in education as separate and distinct from that of other subjects.

One of the most difficult problems that teachers confront when undertaking botany work is the selection and organization of the materials for class work. There are several types of botany courses outlined in botanical literature, but with all these, seldom does the teacher find one to his liking. Of the sixty-eight persons reporting to this questionnaire, forty-five sent brief outlines of the work done in their classes. From the list of topics given one can see that almost every phase of botany is touched upon in high school work. Thirty-three schools study the structure and functions of the organs of seed plants; thirty-one give the evolution series; sixteen classification; fifteen forestry and tree classes; nine ecology; seven agricultural materials; seven pollination; five soils; four weeds; three horticulture; three reproduction; two plant industries; and one each for the food groups, botanical chemistry, theory of evolution, survival of the fittest, and mitosis. This is a wide field to be covering in one year's work, yet with the exception of the last three or four topics, all have a legitimate claim to a place on the program. Two things stand out pre-eminently above the rest: the structure and function of seed plant organs and the evolution series. If these were the only topics, it is at once evident that the work cannot be handled with slight preparation.

The majority of schools claim to be giving their courses a practical emphasis, but in many cases "practical botany" means nothing more than a mere study of the textbook. This attempt at teaching utility botany without knowing what it means is doing very much to break up the organization and destroy the results that should be obtained from a study of botany.

Studying these outlines of courses in the State one is forcibly struck by the variation in them. No two schools seem to be doing the same things at the same time. The work on flowers is given in fall, winter, and spring. Other topics are as widely dispersed thru the year's work in different localities. This wide variation bears witness to the fact that there is no correlation of the botany work in this State. No doubt local conditions should govern to some extent the order of topics, but it is hardly probable that they should require that ecology, pollination, and flower structures should be given in midwinter when eleven inches of snow cover the ground. This lack of correlation among high schools, and with the other sciences in the same schools, is one of the weakest points in the botany work.

So far as the subject-matter is concerned no harm can be done by jumbling up the work, but so far as the living interest in the subject and the welfare of the child are concerned, this disorganization should not be permitted. The arrangement of topics in a high school course is a much mooted question, and can be settled only by a thoro understanding of the true aims of the work. A close familiarity with Lloyd and Bigelow's last edition of "Biology in Secondary Schools" will aid materially in the work.

While botany in Indiana high schools is not satisfactory, it would not be fair to say it is an absolute failure. Much good is being done in many quarters in spite of the defects. All the blame for inefficient work should not fall upon the heads of the teachers nor should the burden of supplying remedies be left altogether to them. The work needs careful supervision. Botany courses without good laboratories and efficient administration should not exist, nor should teachers be allowed to hold the work out as a sort of bait for popularity. School officials should demand teachers well prepared for the work, both in subject-matter and in the teaching thereof. They should require that the courses be organized according to the best modern ideas, and that there be correlation with work in other schools and with the other sciences. This does not mean to follow a hard-shelled course, but a carefully worked out standard. Why should there not be standards for science work as well as for Latin, mathematics, and so forth? If administrative officials should adhere closely to these requirements, the discrepancies in science teaching would soon disappear. These requirements would soon bring about the same results as those that raised the standard of high school teachers from mere license-holders to college graduates, and the efficiency of science work would soon be greatly increased.

MR. HINES: The next address on the program is entitled "Standards and Measurements in English Composition", by Mr. Earl Hudelson, Critic Teacher in English, Indiana University.

STANDARDS AND MEASUREMENTS IN ENGLISH COMPOSITION

MR. HUDELSON: Mr. Chairman, ladies, and gentlemen, I shall give a brief report of a test made in the local schools in the seventh, eighth, and ninth grades, based upon the Harvard-Newton scales test in composition, and the conclusions arrived at by Miss Kerr, Principal of the Department building, and myself. This test was based merely upon description, following the Harvard-Newton scale. The test was made with 386 pupils. There were twenty graders, eight of them being high school teachers, four seventh- and eighth-grade teachers, and eight students of the University.

The test was made on February 23d of this year, and because it may seem a little unfair to high school pupils, please remember that this test was made immediately after the middle of the year, at the beginning of the second semester, when the pupils that are called 7A's were really 7B pupils. This work was done immediately after they had finished their 7B semester; so that the test covers two and one-half years in the grades, and a half-year in the high school. Unfortunately we have too few semesters in the high school to make the test as fair to the high school pupils as to those in the grades.

We found that this Harvard-Newton scale suggested subjects that were not suitable to this locality, so we substituted topics, or subjects, as nearly their equivalent as possible. The seven subjects for description which we offered were: (1) Some Person in Bloomington; (2) Grandmother; (3) An Old Fashioned House; (4) A Picture; (5) A Public Building in Bloomington; (6) A Body of Water; (7) A Wreck.

Thirty minutes were given for actual composition of the first draft, ten minutes for preliminary explanation, and thirty minutes for writing. Later the pupils were allowed to correct and rewrite for thirty minutes more. These papers were collected and numbered. There was no means of identification on any of the pages except the first, which was a key sheet indicating the writer of each composition and his number, and which was kept in the office. After the papers were jumbled, they were divided into eight groups of approximately fifty each, and each group was then rated by three graders. These results were kept separately; the average was also taken; and later, as I shall explain, they were graded again. The above results were put in both tabular and pictorial form.

TABLE VI.—ACHIEVEMENT IN COMPOSITION (DESCRIPTION) BY GRADE AND SEX OF 386 PUPILS IN GRADES 7, 8, AND 9 IN THE BLOOMINGTON SCHOOLS, AS MEASURED BY THE HARVARD–NEWTON SCALE (APRIL, 1915)

The figures represent the average obtained from the ratings of three different judges.

Grade...	7B			7A			8B			8A			9B			9A			Total		
SCORE	Boys	Girls	Total	Boys	Girls	Total	Boys	Girls	Total	Boys	Girls	Total	Boys	Girls	Total	Boys	Girls	Total	Boys	Girls	Total
44.......	6	.....	6	2	.....	2	1	.....	1	1	1	2	.....	.....	.....	.....	.....	.....	10	1	11
45.......	.....	1	1	.....	1	1	.....	.....	.....	.....	.....	.....	1	.....	1	.....	.....	.....	1	2	3
46.......	1	.....	1	.....	.....	.....	2	.....	2	.....	.....	.....	1	.....	1	.....	.....	.....	4	0	4
47.......	.....	2	2	.....	1	1	.....	1	1	2	.....	2	.....	.....	.....	1	.....	1	3	4	7
48.......	1	.....	1	1	1	2	1	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	3	1	4
49.......	.....	.....	.....	.....	.....	.....	1	.....	1	.....	.....	.....	.....	1	1	.....	.....	.....	1	1	2
50.......	2	2	4	3	.....	3	.....	.....	.....	.....	.....	.....	.....	1	1	.....	.....	.....	5	3	8
51.......	2	2	4	.....	1	1	2	.....	2	.....	.....	.....	3	.....	3	.....	.....	.....	7	3	10
52.......	1	1	2	1	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	1	3	1	4
53.......	.....	.....	.....	1	2	3	1	.....	1	1	.....	1	1	.....	1	2	.....	2	6	2	8
54.......	.....	1	1	1	1	2	3	.....	3	.....	.....	.....	.....	.....	.....	1	1	2	5	3	8
55.......	1	1	2	.....	2	2	.....	.....	.....	2	.....	2	.....	.....	.....	1	1	2	4	4	8
56.......	.....	1	1	1	1	2	3	1	4	.....	1	1	.....	.....	.....	.....	.....	.....	4	4	8
57.......	1	1	2	1	.....	1	.....	1	1	1	.....	1	.....	.....	.....	.....	.....	.....	3	2	5
58.......	1	4	5	1	2	3	1	2	3	1	1	2	1	1	2	1	.....	1	6	10	16
59.......	2	2	4	1	3	4	.....	1	1	2	1	.....	1	3	3	1	.....	1	6	9	15

TABLE VI.—Continued.

Grade...	7B			7A			8B			8A			9B			9A			Total		
SCORE	Boys	Girls	Total	Boys	Girls	Total	Boys	Girls	Total	Boys	Girls	Total	Boys	Girls	Total	Boys	Girls	Total	Boys	Girls	Total
60......	1	1	2	......	......	......	2	3	5	1	2	3	2	1	3	1	......	1	7	7	14
61......	2	2	4	1	2	3	1	......	1	......	......	......	1	......	1	1	......	1	6	4	10
62......	......	......	......	3	......	3	......	......	......	......	1	1	......	......	......	3	......	3	6	1	7
63......	2	2	4	......	2	2	2	1	3	1	......	1	1	......	1	1	......	1	7	5	12
64......	1	......	1	1	5	6	......	2	2	1	1	2	3	2	5	2	1	3	8	11	19
65......	......	......	......	......	4	4	1	1	2	......	2	2	......	1	1	2	......	2	3	8	11
66......	2	......	2	......	1	1	......	1	1	4	......	4	2	1	3	3	4	7	11	7	18
67......	......	1	1	......	3	3	1	4	5	......	2	2	......	1	1	1	2	3	2	13	15
68......	2	1	3	1	2	3	......	3	3	1	3	4	2	1	3	3	3	6	9	13	22
69......	1	1	2	......	2	2	......	2	2	......	2	2	1	......	1	......	1	1	2	8	10
70......	1	2	3	1	......	1	......	1	1	2	3	5	2	1	3	2	3	5	8	10	18
71......	......	1	1	......	1	1	1	2	3	1	1	2	1	1	2	1	......	1	4	6	10
72......	1	3	4	......	2	2	......	......	......	......	2	2	......	1	1	1	1	2	2	9	11
73......	1	......	1	......	......	......	......	3	3	......	......	......	......	4	4	......	......	......	1	7	8
74......	1	......	1	1	......	1	......	2	2	......	......	......	......	......	......	2	......	2	4	2	6
75......	......	......	......	......	......	......	......	......	......	1	5	6	......	......	......	......	2	2	1	7	8
76......	1	......	1	......	3	3	......	4	4	......	1	1	......	3	3	2	2	4	3	13	16

77				1		1	1	1	2	1		1							3	1	4
78					1	1				3	1	4		3	3	1	2	3	4	7	11
79		1	1					3	3								1	1		5	5
80					2	2							1		1				1	2	3
81					2	2							1	2	3				1	4	5
82								1	1		2	2		2	2					5	5
83								1	1				1	1	2				1	2	3
84											1	1					1	1		2	2
85					1	1					1	1		1	1	1		1	1	3	4
86					1	1		1	1		1	1					1	1		4	4
87				1		1													1		1
88								1	1		1	1								2	2
89											1	1								1	1
Total	34	33	67	23	49	72	25	43	68	25	36	61	25	32	57	35	26	61	167	219	386
M	59.5	59.5	59.5	59.	65.2	64.	56.6	69.5	65.5	66.2	70.6	69.	64.6	73.	68.3	66.	70.	68.	62.	68.3	65.9
M. D.	9.7	9.3	9.3	7.5	7.5	8.0	6.1	7.5	8.7	8.5	6.2	7.4	6.8	8.5	9.0	6.	5.2	6.5	7.5	8.4	7.9
V	16.%	15.6%	15.6%	13.%	11.5%	12.5%	10.8%	10.8%	13.%	13.%	8.8%	10.7%	10.5%	11.6%	13.%	9.%	7.4%	9.6%	12.%	12.3%	12.%

Table VI is a tabular view of the achievement in composition by grades. Here you will find what is to be expected. The numbers are grouped largely in the middle. You will find in the boys' columns the larger figures. Those at the top are larger for the boys than for the girls. Ten boys and one girl received 44 percent, or below. At the top the boys outnumber the girls. At the bottom, (the highest percent being 89), the girls predominate. The largest number of cases falls near the middle—about 65 percent.

The majority of both sexes in 7B were nearly together; but the best girls outdid the best boys by almost 20 percent. The 7B results were neither satisfactory nor typical of total results.

In 7A the boys were about as closely grouped as the girls, the latter, however, being bunched farther up the scale. There was practically the same gradation at either end of the scale, but the grouping was more typical of the entire results of the test.

An equal but slight improvement was made by both sexes in 8A, the comparative rank and the gradation effect remaining about the same. In 9B, however, while the grouping of the girls was not so high in any one place, the general results were more favorable. The boys made a marked rise, their average mounting to between 45 and 60 percent.

The 9A boys made a slight and typical improvement. The girls' grouping was comparatively higher and was characteristic of final results, because it was highest about the composite total median.

The total distribution by sex shows the same general results. One is a little higher than the other, with much in common; but the girls have the advantage. The total results, while indicating nothing but total results, show the usual scale and gradation of the scale, which will be seen, in a moment, in the median group, to be between 65 and 70 percent. I do not know whether the girls do better than the boys because of the greater number of women teachers in the schools or not. I do not know the cause, but I intend to take the results back to the teachers and try to diagnose with them at least some of the causes of these conditions.

Fig. 27 is a pictorial view of the achievement by sexes and grades, and you will see here, in briefer form, starting from the same point, how the girls outstrip the boys in accomplishment. The lower line represents the boys and the upper line the girls. Starting at 59.5 percent, the curve for the boys descends thru grades 7A and 8B, to 56.5 percent, while that for the girls ascends steadily to 73 percent in the 9B grade. The course of progress for the boys shows a sharp rise in the 8B grade. The second year of high school gives results that are entirely promising, I think, because it seems that here the pupils get on their feet again. Mr. Lewis's charts at the end of the room show how in the Muncie schools whenever the pupils changed schools or buildings they were more or less carried off their feet, and that there was either a decided slump or no rise in achievement, because of the changed conditions. The girls seem to have suffered more by these changes into the high school than the boys. Whether the former recovered from this in the second year of high school and immediately went on above the boys we do not know; but the indications are that the boys and girls are becoming more nearly equal in ability. The median line for the boys, in all grades, is 62 percent, and for the girls, 68.3 percent, showing the usual conditions, I believe, for the girls. The total median for the boys and girls together is about 65 percent.

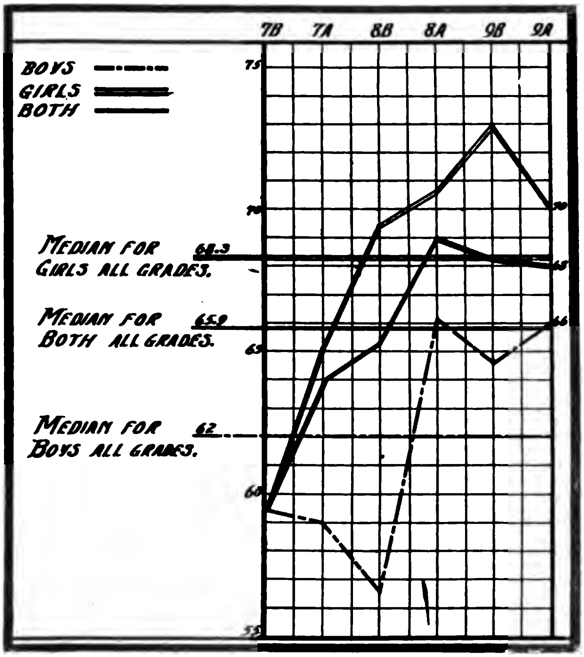


FIG. 27. GRAPHS BASED ON TABLE VI.

In choice of subject, by sex and by totals, there was found to be a pretty consistent grouping on certain topics, with wide divergence on others. Almost an equal number of each sex chose "Some Person in Bloomington" to describe. The girls were decidedly partial to "Grandmother". "An Old Fashioned House" and "A Public Building in Bloomington" were also popular subjects. The few of either sex that selected a picture did well. The girls shunned "A Body of Water", and found "A Wreck" uninteresting. Several of the boys recognized in these topics better opportunities for description. In choice of subject the boys and girls approached each other more nearly in the last grade.

In comparing the ratings of the 386 themes with and without the Harvard-Newton scale it was found that the highest and lowest rated compositions were identical in nearly every case. Almost the only diversities of opinion in the rankings of the grades—and even these were usually slight—were in the mediocre papers. The range of variation in grade with the scale was about 1.5 percent less than the range without the scale. This would indicate that such a scale as that used in the Harvard-Newton test will slightly steady the pupil's composition average by reducing the teacher's susceptibility to changing moods. No scale, however, will suit all localities, because no set of topics will furnish the proper motive for pupils of all districts. Each region, or even each school system, should work out its own scale in all the discourses, if it would profit most highly from the results that were first indicated by the Harvard-Newton test.

The next paper on the program was to have been given by Mr. Frank G. Pickell, Principal of the Richmond high school, but he was unable to arrive in time to read his paper. However, his paper was subsequently received, and is included in the proceedings.

DISTRIBUTION OF TEACHERS' MARKS

MR. PICKELL: A study of this problem reveals a wide variation in the distribution of teachers' marks. It reveals the lack of uniformity in rating pupils among teachers of the whole school; and likewise among teachers in any given department.

It is not probable that the classes assigned to any teacher are very much superior to the classes of any other teacher. In the organization of a school of three hundred or more pupils this would be the exception. The variation is not likely to be largely dependent upon the subject-matter, altho the prescription of studies in the majority of cases means a higher percent of failures than in elective studies. The problem of the standardization of the content of the courses enters into the percent of failures and perhaps in a degree into the problem of distribution of marks. However, facts show that teachers, in the absence of more or less carefully defined standards for judging merit, or ability, or progress, are unable to judge accurately the worth of the pupils' work, and this accounts in a large measure for the lack of uniformity.

Many experiments have been made showing the wide variation in the marks given, say, the same English composition, or the same arithmetic paper by different teachers, and indeed by the same teacher at intervals far enough apart to make the experiment a test.

In my faculty the teachers felt the need of greater uniformity in marking pupils, and a survey of actual conditions was made. Twenty-nine members marked the same algebra paper, the same two English compositions, and the same arithmetic paper. The experiment as made was not sufficiently scientific to warrant drawing conclusions too hastily, but it showed certain tendencies in marking pupils and probably certain facts. Following is a summary:

Variation in Marks (29 Teachers)

Algebra	lowest 52	highest 80	mean variation 7.1%
Composition (No. 1)	lowest 46	highest 85	mean variation 8.1%
Composition (No. 2)	lowest 58	highest 96	mean variation 7 %
Arithmetic	lowest 48	highest 88	mean variation 6.2%
			Average variation 7.1%

Variation in Marks Given by Mathematics Teachers

Algebra	lowest 65	highest 78	mean variation 5.5 %
Arithmetic	lowest 48	highest 77	mean variation 9.75%
			Average variation 7.6 %

Variation in Marks Given by English Teachers

Composition (No. 1)	lowest 70	highest 80	mean variation 3.7%
Composition (No. 2)	lowest 60	highest 90	mean variation 10.8%
			Average variation 7.2%

In making the survey of the distribution of marks for the last half-year we found that the variation indicated by the above experiment did transfer. One teacher gave no marks between 95 and 100, while a second had 21 percent of all marks within this percent group. In the same department we found the marks for this percent group (95-100) varying from 4 percent to 19 percent. In the percent group 85-89 one teacher had marked 12 percent of his pupils; a second 79 percent; a variation of 65 percent. These are the extremes, but a study of the facts revealed a lack of uniformity everywhere.

From these facts we drew three conclusions: First, a four- or five-division scale for marking pupils would be more accurate than the present percent system, or present letter systems in which the letters represent a latitude of only two or three percent. In this scale the letters should represent a latitude of about seven percent, and no attempt should be made to determine whether the student belonged at the top or at the bottom of his division.

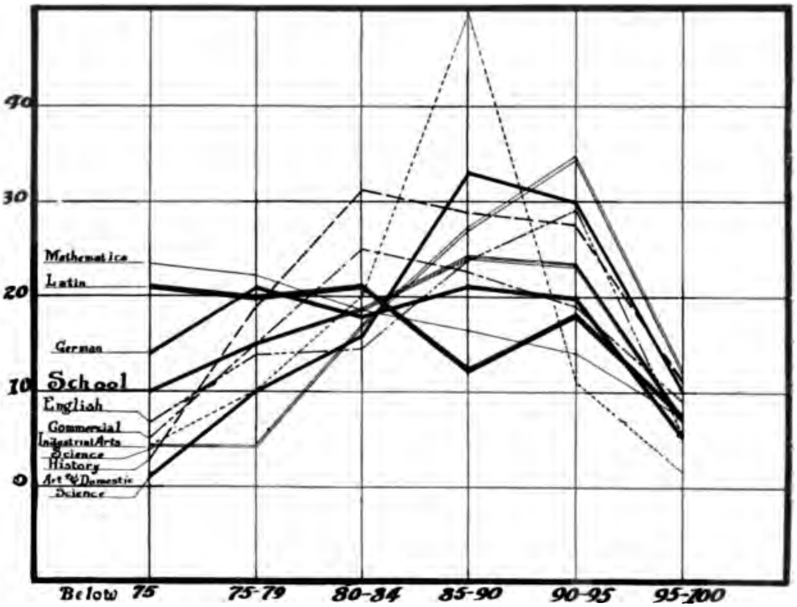


FIG. 28. PERCENT OF FAILING AND PASSING GRADES BY SUBJECTS OF PUPILS IN THE RICHMOND (IND.) HIGH SCHOOL, 1914-15, FIRST SEMESTER

Second, in the absence of scales for measuring ability or progress, it would possibly be wise to adopt some scheme for controlling the distribution of marks. When we recall that progress thru school, entrance upon college work, the awarding of scholarship, the winning of prizes,—in fact, the fabric of the school system,—depend very largely upon teachers' marks, the importance of aiding the teacher in accuracy and good judgment is clearly seen That teachers do vary in their marks is in no wise a criticism upon them. It is rather the indication of the fact that the system has little to offer the teacher as an aid, and further that human traits are hard to measure accurately.

Third, we should do all we can to help in the great educational movement of developing scales and standards for judging school progress. It will, no doubt, be a very difficult task to develop a scale for measuring geometry ability, or history ability, but it can be done. Remember how few believed that scales could be devised for measuring handwriting and spelling. And experience in using these scales has shown that we can become much more accurate in our judgment than without their use.

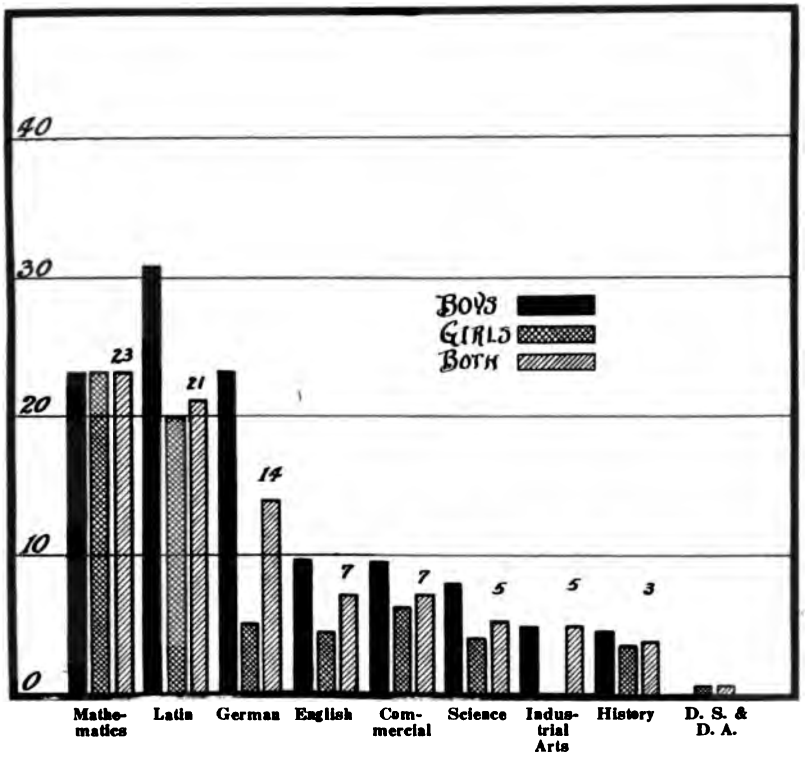


FIG. 29. PERCENT OF FAILURES BY SUBJECTS OF PUPILS IN THE RICHMOND (IND.) HIGH SCHOOL, 1914-15, FIRST SEMESTER

Many other problems arise for consideration in connection with a study of teachers' marks, such as elimination, retardation, the prescription of studies, failures, and allied problems. All these are serious enough to warrant full treatment. We can take up but one briefly,—the problem of failures.

The percent of failures by departments for the past year in the Richmond high school varied from 0 percent in cooking and sewing to 23 percent in mathematics.

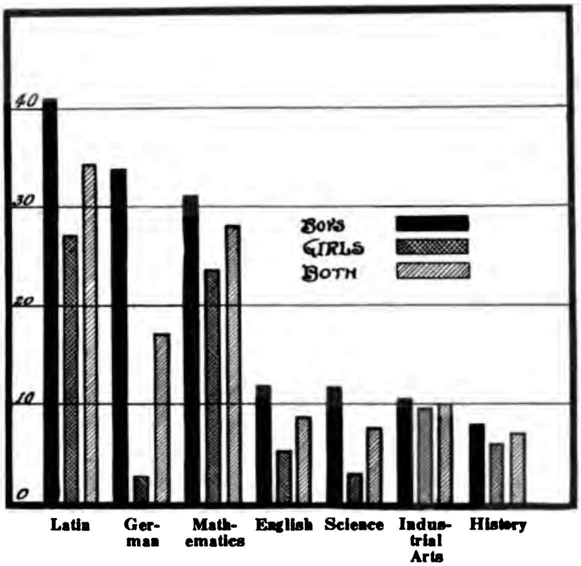


FIG. 30. PERCENT OF FAILURES IN FIRST YEAR SUBJECTS OF PUPILS IN THE RICHMOND (IND.) HIGH SCHOOL, 1914-15, FIRST SEMESTER

The following table shows the failures by departments for Sept., 1914, to Feb., 1915:

Mathematics	24%
Latin	18%
German	15%
Commercial	8%
English	7%
Science	6%
Industrial Arts	5%
History	3%
Domestic Science and Domestic Art	0%

Why should 25 percent of the pupils fail in mathematics and only 6 percent in science? Or 18 percent in Latin and only 3 percent in history? Is this difference due to subject-matter, methods of teaching, to the fact that more of mathematics and

Latin are prescribed than science and history, or to all of these things?

Why is it that in every department in school in first-year studies a larger percentage of boys failed than girls? And why is it that the percentage of failures for both boys and girls in first-year studies is higher than for boys and girls in second-, third-, and fourth-year studies? These and many other questions arise for definite answers. School men cannot longer ignore them. Conditions must be studied, facts searched out, and the remedy for existing defects applied.

MR. HINES: Mr. Ayres will conduct a round table at this time on "The Measurement of Educational Processes and Products". I have the pleasure of presenting Mr. Ayres.

THE MEASUREMENT OF EDUCATIONAL PROCESSES AND PRODUCTS

MR. AYRES: The educational instrument most typically characteristic of the new movement for scientific methods in education is the educational scale. These pedagogical scales are essentially different from other forms of tests and examinations. They are like physical scales in that they consist of a series of steps equally distant from each other and having a known relationship to a zero point. Our common scale for measuring short distances is the foot rule. This consists of a series of twelve steps, each one inch long, and all having a common relationship to the beginning or zero point, which represents just no distance at all. Similarly our scale for measuring small weights consists essentially of a determination of total weight in terms of one pound, two pounds, three pounds, and so on. These and all the other similar cases consist of series of steps equally distant from each other and having a common relationship to a zero point. Recently we have begun to develop such scales in the field of education. But when we measure our educational product by such a scale the result is very different from measuring it by the ordinary percentage method customarily used in the classroom.

When the child in the composition class receives a mark of eighty percent this does not mean that the product is twice as good as that of another child whose mark was forty percent, or that it was four-thirds as good as that of the child whose paper was marked sixty percent. In other words, school marks do not follow the ordinary rules of common arithmetic. This is precisely what the markings obtained by the new pedagogical scales do accomplish, and this is one of the reasons why the development of these scales marks so important an advance in the science of education.

In order to secure this characteristic of having the successive steps on the scale indicate progressive values increasing by equal amounts, all of the new scales are fundamentally based on the theory of the so-called normal distribution of intellectual abilities. For this reason we should understand something of the nature of the normal distribution surface if we are to consider intelligently the nature of the new educational scales.

If you should go out under a tree and pick up 10,000 leaves and place these leaves in a long row according to size so that the smallest leaf was at the left end of the line and the biggest one at the right end you would find that you had a very few very tiny leaves, a great number of medium-sized leaves, and a very few very large leaves.

If you now should draw a diagram illustrating by means of a surface of frequency these results, that diagram would be in the form of a bell-shaped curve. At the left the curved line would be very slightly above the base line, indicating the small number which are very small leaves. From here it would rise rapidly, first in a convex and then in a concave curve until it was a long distance away from the base line, thus representing the large number of leaves of medium size. From this point the curve would run back again toward the base line so as to make a symmetrical figure, and at the right end would again be very close to the base line representing a small number of very big leaves. The resulting curve resembles in shape the heap that is made by dumping a load of sand out of a cart.

If now you should record the heights of 10,000 army recruits of the same race you would find a startlingly close agreement with the conditions disclosed when the leaves were measured. You would find a very few very short men; a great many middle-sized men, and a very few giants. The truism by which we commonly express this is that "most people are of about average height". If you should make a curve enclosing the surface of frequency representing the distribution of these army recruits according to height you would find it almost exactly the same as the curve representing the lengths of the leaves. Again, if you should toss a number of pennies into the air and record each time how many fell heads up and how many fell tails up you would find that very rarely would they all fall heads up, and very rarely would they all fall tails up, and that most of the time they would fall about half heads and half tails up. If you should draw a curve representing the results of these various trials you would find once more that it was practically the same curve.

If now you test a great many third-grade school children as to their ability in spelling you will find among them very few very poor spellers; a great many medium spellers; and very few very excellent spellers. Moreover, you will find that they are distributed as to their spelling ability in just about the same way as men are as to heights, and leaves are as to lengths. The same great law of nature which controls these phenomena emphasizes its workings in a large range of physical, biological, anthropometric, and intellectual settings. Mathematical laws concerning the characteristics of the surface of normal distribution have been most accurately determined, and it is thru the application of these laws that it is possible to determine and locate the steps on the different scales for classroom performance.

Classroom scales may be divided into three classes, according to the basis on which they rest. The first class consists of scales based on a concensus of judgments. The Thorndike handwriting and drawing scales and the Hillegas composition scale are good examples. The values of the successive steps of these scales are determined by the concensus of judgments of competent judges. The second class of scales consists of those based on measurements of function. The Ayres handwriting scale is a good example in this class. Here the steps were determined by careful measurements of the legibility of the different samples of handwriting. The third class of scales consists of those based on right and wrong cases. Such, for example, are scales for measuring attainment in spelling and in arithmetic where the words spelled or the examples are considered as either right or wrong.

It is probable that a large proportion of the pedagogical scales of the future will be based on the concensus of judgments by competent judges. Now in the case of many sorts of classroom work it is hard to see how any other satisfactory basis for scale-making can be found. In drawing, English composition, music, and so forth, it is surely difficult to measure results save by means of a scale which is based on the judgments by competent judges. To illustrate how such a scale may be constructed we may consider the judgments of some of us in this room with respect to the general beauty of these six neckties which I have brought in order to illustrate the more important steps involved in constructing a judgment scale. Let us assume that we are to judge these neckties not for color, or length, or texture, or design, but for general good-lookingness. In order that we may distinguish them from each other let us arbitrarily fix these letters M, L, R, X, S, and T.

I will now ask six of you in turn to state which necktie you consider the best looking, which the next best looking, which the next best looking, and so on down to the least good looking. This series of six judgments makes a table like the following when we record the judgments. In each case we call the one judged the best looking No. 6, the one next best looking No. 5, and so on down to the least good looking one which we call No. 1. The judgments of six people are recorded.

6	5	4	3	2	1
X .	S	M	R	T	L
S	X	M	R	T	L
X	M	S	R	L	T
M	X	S	R	L	T
X	M	S	R	T	L
M	X	S	T	L	R

If now we add up the number denoting the location of the different letters in this table we find that the highest one, that of X, scored 33; then come M with 30; S with 27; R with 16; T with 11, and L with 9. It is plain that the censensus of judgments is to the effect that X, which has the highest score, is all in all the best looking tie. It is equally plain that the concensus of judgments is that M is the next best looking and so on down the line until we get to L, which is judged to be the least good looking. We have here the beginning of the scale, and if we should take a yardstick we might begin to locate points on it by starting with our least good looking necktie, which is L, and hanging it on the yardstick at the nine-inch mark. We can then hang up T at the 11-inch mark; R at the 16-inch mark; S at 27; M at 30; and X at 33. Here we have the beginnings of a scale which goes not only from lower qualities to high qualities, but in which something of the relationship of the locations is indicated.

Now this simple method is adequate to show some of the general underlying theory, but it is not adequate to show the entire process of this sort of scale making. To begin with, if all of the judges had decided that one of the neckties was the least good looking or the most good looking, we should have been unable to locate that one on our scale. We should have known that it belonged at one end, but not just where it was located, whether a very long way out at that end or just beyond our next specimen. Again we cannot exactly locate the steps on our scale by the simple process we have used here. The reason for this is that equal percentages of judgments have more weight in the middle of our scale than they have at the end of it. That is to say, that if we had here a scale running from zero to 100, in this particular matter that we are judging, it would require a greater difference in the beauty of two samples to bridge the gap between 90 percent of the judges and 100 percent of the judges considering it the best looking, than the amount of increase that would be necessary to secure an advance in judgment from 60 percent of them to 70 percent of them. The mathematics involved in this part of scale-making goes back to considerations of the nature of the surface of normal distribution, which can only be very briefly considered here. A third shortcoming of our illustrative scale is that we have not as yet determined its zero point.

These shortcomings are matters which for the moment we may waive in the interests of passing on to consideration of the fundamental characteristics of the other classes of scales.

It seems clear that we shall have in the future some scales based on function. As has already been mentioned, the Ayres handwriting scale is such a one. In this case the fundamental hypothesis was that the principal function of handwriting is to be read, and hence the best criterion of its goodness is its readability, which is to say its legibility. A great many samples of handwriting were then scored according to their legibility, which was determined by several thousand carefully timed readings. On the basis of these records the scale was developed.

One may readily imagine a scale for general merit of appealing letters sent out by philanthropic organizations. Such a scale might be based on the amount of subscriptions solicited by these form letters. This would be a scale based on function. In similar ways a scale of advertisements might be constructed on one of a given type of statistical diagrams.

Scales for measuring attainment in such subjects as arithmetic and spelling differ in nature from those we have been considering in that we do not commonly measure results thru a long series of progressive impressions, but rather by finding out whether the example worked or the word spelled is correct or incorrect.

An illustration of how such a scale is constructed is furnished by a scale for measuring ability in spelling, which has just been completed by the Division of Education of the Russell Sage Foundation. The basis of this scale is the one thousand commonest words in English writing. The identity of these words has been determined by combining the results of four extensive researches, carried thru with the aim of finding out which words are most often used in our writing. After these thousand words were selected they were combined in spelling tests and sent to be spelled by children in the grades from the second thru the eighth in a large number of cities. Figures were secured showing how well these thousand words were spelled by 70,000 children in 84 widely separated cities. This involves an aggregate of 1,400,000 different spellings.

Suppose now that we consider the surface of frequency which we have here illustrated as representing 100 typical third-grade children. We will suppose that these children are ranked according to their spelling ability from the worst to the best. If now they are given the sort of spelling test we are talking about we shall find that 93 of them can successfully spell the word "have" while the remaining seven will fail on it. This tells us something definite about the location of the word "have" on a spelling scale for third-grade children. If we keep on with our testing we shall find that 69 of these children can succeed in spelling the word "yesterday" while 31 of them will fail on it. This gives us some definite information about the location of this word on our scale. If now we investigate the nature of this surface of frequency we shall find that the most convenient unit for measuring distances along its base line is one which is known as the sigma distance. This is a constant function of the normal frequency surface. It is equal to the distance from the point on the curve where it changes from convex to concave to the median line in a direction parallel to the base line. If we take this sigma distance and lay it off on the base line so that it extends just an equal distance to the left and the right of the point where the median line intersects the base line we shall have two points on our base, the left hand one of which we may designate as 40 and the right hand one as 60. If now we lay off this sigma distance two more times to the left we shall have two new points which we shall designate as 20 and as zero. By doing the same thing on the right we shall have two more points which we shall designate as 80 and 100. In doing this we are taking certain liberties with our surface of normal

frequency which are explained in the forthcoming publication of the Sage Foundation describing this spelling scale (Fig. 31).

If now we erect a vertical at the point marked 20 we shall find that we have on the left 7 percent of the area of our curve and on the right 93 percent. If now we consider this surface as representing the 100 typical third-grade children as previously explained we find that we have on the left the seven children who cannot spell "have" and on the right the 93 who can. The point indicated as 20 is, then, the location of the word "have" on a scale for spelling among third-grade children. In a similar way if we erected at a point marked 40 another vertical we shall have on the left 31 percent of the surface which we may think of as representing the 31 children who failed on the word "yesterday". This point then shows the location of that word on our scale. In a similar way all of the words have been located on the scale, not only for the third grade but for all the grades from the second to the eighth. All of this will be much clearer if you will examine the copies of the new spelling scale which will be passed out.

Now I have ten minutes left, and we will use that ten minutes for questions. Does any member of the conference desire to ask a question?

QUESTIONER: In case you want to introduce a word how would you locate it in your chart?

MR. AYRES: Suppose we had a word not included in the thousand commonest words, how should we locate it in the chart? That could only be done fairly by having it spelled by the children in several grades in a large number of cities. Otherwise it would not be comparable, you see, with what is already on the chart. If I should do that and find out how well the children in the different cities, a considerable number of them, actually spelled it, then it is perfectly easy. We simply look it up and find the corresponding figures here (indicating) and put it in that column. No trouble at all. This chart could readily be increased to two thousand or three thousand words, so long as you do not include in it words that were misspelled not because they were essentially difficult to spell but because they were rare. Many relatively easy words are misspelled if they are not within the customary spelling vocabulary of the children. The advantage of these words is that they are all within the everyday spelling vocabulary; but the other words can be added easily if it is considered desirable.

QUESTIONER: Does the scale apply to all the grades?

MR. AYERS: The scale applies to all the grades from the second to the eighth.

QUESTIONER: What would you do with the third-grade pupil if he spelled all the first words right in the first part of the term?

MR. AYRES: We would put him in the fourth grade of spelling.

QUESTIONER: What would you do with him in the middle of the year?

MR. AYRES: Well, you would just keep on putting him where his achievement showed that he could carry the work.

QUESTIONER: Would you determine the spelling by column or text tests?

MR. AYRES: This work was all based on dictated column tests, that is, words not in sentences. I am inclined to think that there are good reasons why we are about to look more favorably on column tests than we have been doing in the past five years.

You will find a good discussion of that in a new book entitled *The Child and His Spelling,* by Cooke and Loshar, published by the Bobbs-Merrill Company. I cannot go into the merits of the controversy here and now, but for this kind of a test, in order to have conditions as nearly as possible as they were in the work basic to this scale, I should favor column testing rather than text testing.

QUESTIONER: In that book the discussion favors the column test as being easier. Is it your judgment that children will spell more readily in column testing than they will in contextual spelling?

MR. AYRES: The argument of the book is in favor of column testing resulting in better spelling than contextual testing. I think that within some rather well definable limits the argument is well taken.

QUESTIONER: Is not the ability to spell in composition the final testing of spelling, and didn't you take that test yourself when you examined those two thousand letters?

MR. AYRES: The question is, Is not composition the final testing of spelling? It is, beyond question. The final test is spelling the words in writing for an actual use.

QUESTIONER: That is practically the only use and purpose we have in spelling, is it not?

MR. AYRES: The question is, Is not that the only purpose we have in spelling? Practically it is. I am sorry to say that the time is exhausted.

MR. HINES: The last address of the morning is on the subject of "Educational Diagnosis", by Dr. S. A. Courtis. Ladies and gentlemen, Mr. Courtis.

EDUCATIONAL DIAGNOSIS

MR. COURTIS: Mr. President, ladies, and gentlemen, members of the conference, I took up with you yesterday the question of the use of standard tests for the purpose of supervisory control. Today I want to continue that discussion from the other side of the story, the use of tests by the teacher; and I have given the title "Educational Diagnosis" to this lecture because it expresses better than any other phrase I know the point that I want to make;—that the teacher needs to determine by measurement the exact causes of failure in children and to plan the drills and teaching accordingly. I shall try to make that point plain as we go thru with the results I have to show you this morning.

I want to resort to the idea that Dr. Ayres used yesterday, that education, teaching, is a manufacturing process in which we attempt to take the raw material, the child, and to make out of it a certain finished product. That is, in your minds, I want to reduce the teaching process to its lowest term. Let us get it down to a situation of this kind, where we can see that we are trying to make a change in a certain material in order to get a certain product, and that there are acting not only the forces which we exert, but also other forces outside of those under our control. These act either with or against the forces which we employ.

Now manifestly, if we have forces like these (indicating) which are acting against the efforts that we are making, it becomes important that we know what those forces are and how to control them; and if there are forces like these (indicating) which are acting with ours, we want to learn also how to control them. And the point I make today is that by educational diagnosis I mean the determination of these various forces and their control under the conditions of the class work.

Now what are the factors which control the efficiency of teach-

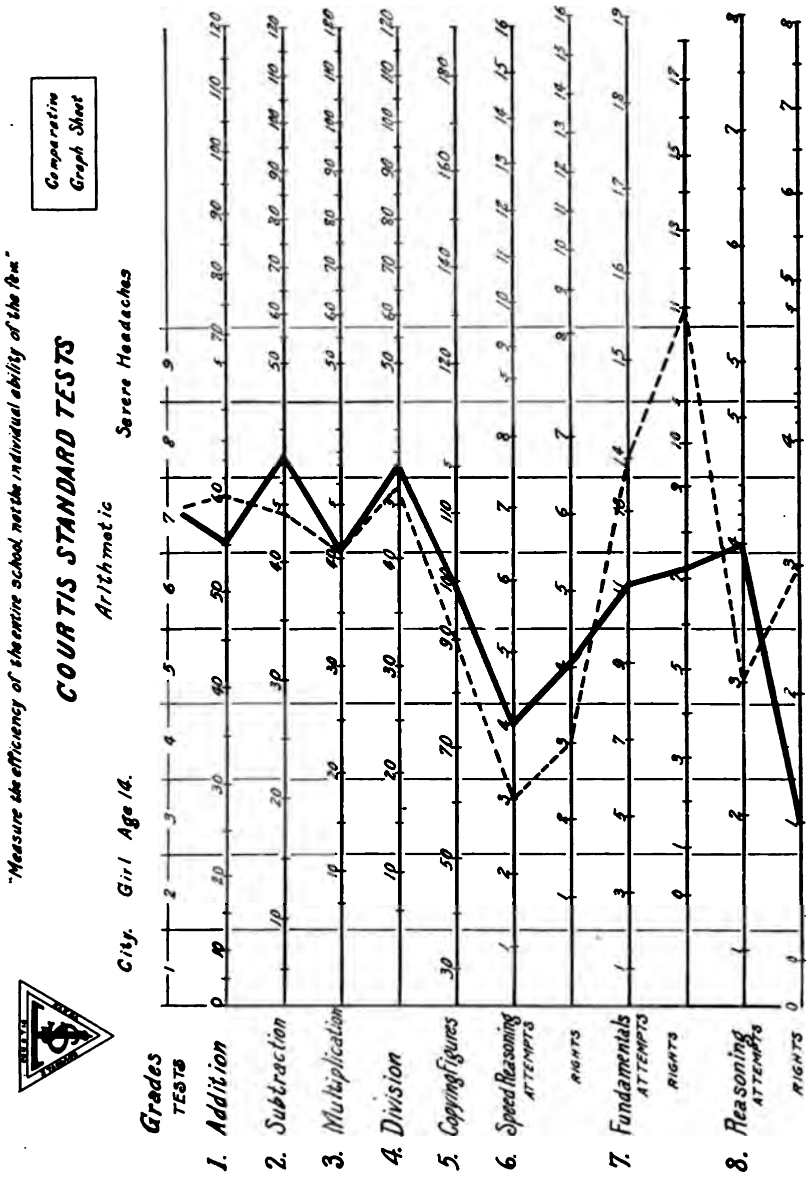

"Measure the efficiency of the entire school, not the individual ability of the few"
COURTIS STANDARD TESTS
Arithmetic
Comparative Graph Sheet
City. Girl Age 14.
Severe Headaches
Grades
TESTS
1. Addition
2. Subtraction
3. Multiplication
4. Division
5. Copying Figures
6. Speed Reasoning ATTEMPTS
RIGHTS
7. Fundamentals ATTEMPTS
RIGHTS
8. Reasoning ATTEMPTS
RIGHTS
1
2
3
4
5
6
7
8
9

FIG. 32

ing? I have listed them here as I know them, and I have put them in three groups. The child, first of all, is determined, as I tried to show you yesterday, by his heredity; is determined in part by his maturity and by his past training. Those factors are totally in the past and are beyond our control. We must take the child as we find him. We have a second set of factors which I have listed here as present. That is the child's present physical condition, his mental and emotional condition, and I shall try to show you that these conditions affect results. I listed these as much as anything else to emphasize the point that before we can hope to make our teaching effective we must determine what has been accomplished by past teaching and what the present conditions are. Then we can plan intelligently the proper way to continue the process. Just as soon as we begin to teach, however, we begin to produce changes; and consequently there must be all the way thru a continual measuring, a continual determining of the effect of these factors, as we plan for the future. That is, teaching, in order to be efficient, must bring in this continual effort to find out where the child is, what condition he is in now, what the effect of the things that we do to him is. So that in the whole of this process thru here (indicating) I want you to get the point, as far as I am able to make it, that our work is absolutely conditioned by these factors which influence the child; and only when we adjust our work to those factors can we possibly make progress. You know very well that the laws of gravitation are absolute in their operation. You do not try to go against them. You know that the mind of the child is specialized by his inheritance and by his maturity, and you know also the effect of training. How can you begin to teach until you have determined precisely where the child stands in relation to the ends for which you are working?

Let us consider some of these factors.

Take the physical condition of the child. Fig. 32 is the record of a girl fourteen years old whom the teacher reported as having severe headaches during the whole of the term. This was her record, this dotted line, at the beginning of the year. These are the names of the tests out here. We will not stop to go over them in detail. It is enough to say that they represent eight tests in arithmetic, and this girl was about a seventh-grade girl. If you follow this line thru you can see her standing at the beginning of the year (indicating). Now what was the result of her work for six months? It is shown by this other line (indicating). A little progress there. None there (indicating). Lower score here (indicating) and here and there are the important tests. She has made a very little there (indicating), and she has large losses in most of the other tests.

That is typical, not of a few girls but of many, many children. We have learned that we need to sort out of our classes those who are mentally incompetent to do the work we have planned for any grade. One of these days we shall learn also that we need to sort out of the class those who are physically incompetent to do the work which we have laid out for them. There are many, many children in the schools who are absolutely incapable of doing the work of the term on account of their physical condition, by reason of physical ills which prevent their successful work.

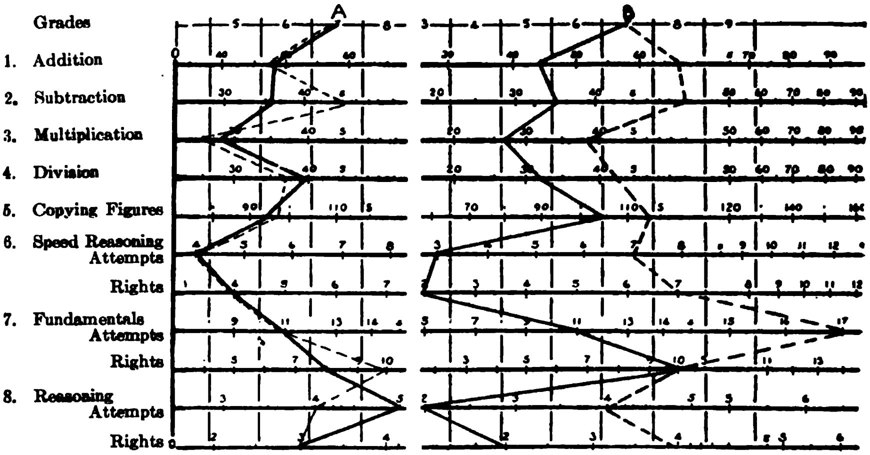


FIG. 33

The same thing is true in Fig. 33. Take the record of these two girls from the Ethical Culture School in New York City. Look at this record in those cases. The solid line represents the record at the beginning of the year, and the dotted line represents the record at the end of that year. That is, the progress in this case was made from October to May. Look at the story in this case (indicating). In the same class, under the same teacher, of course, under the same conditions; and yet look at the difference in the results. What is the explanation? It is a very simple one. On this side is a child of foreign parents, an only child, a child of rich parents, a child not interested in the school work, a child with many outside distractions, with no incentive to effort in school. The girl on this side, however, was given a year in this private school by a relative, and considered that year a year of special opportunity. She worked faithfully thru the year, making the very most of her opportunities; and it was the girl's conscious coöperation with the efforts of the teacher which produced results like this. The question of motive comes into our work all the way thru the school, and only as we can secure the consent and conscious coöperation of the children in the work which we plan for them will we get results like this.

Fig. 34 is another illustration of the same thing. This record resembles the other in that after six months' work this girl has much lower scores and her curve now falls in this column. The only place she had gone ahead is in the test on copying figures, which involved no mental work,—where speed is determined practically by maturity. Since the girl is six months older she has a slightly higher score at the end of the year. In everything else she has gone backward. What was the reason? It is her third year in the grade. If they keep her there long enough I think she will get into the kindergarten, or the school for feeble-minded. This result is typical of what often happens when we make children repeat a grade.

We have a big problem, a problem we need to watch and work out very carefully. It is not enough to say that the child failed. We want to know the precise reason why he failed, whether from causes which are within the school's control or from those beyond the school's control. If the causes are within the school's control then the school is responsible for the child's failure; and the mere repetition of the work, without discovery of the reason why he failed, or without a remedying of the conditions under which he failed the first time, is, from my judgment, criminal.

I suppose very few of you have any idea of the effect of the various factors which are acting upon children when they are doing their work in school. Here is the record, for instance, of a person taking a simple addition test, just the addition of two figures, the addition combinations (or the multiplication combinations), taking such tests every fifteen minutes from half-past six in the morning until eleven o'clock at night. Starting in about half-past six, he has a score like this (indicating); about sixty-five. The second test he is a little lower; the third test is a little lower; the next test is higher; and here is time off for breakfast. Note the rise and fall of the curve. There are certain periods of the day when the person's ability is at a maximum, and other periods

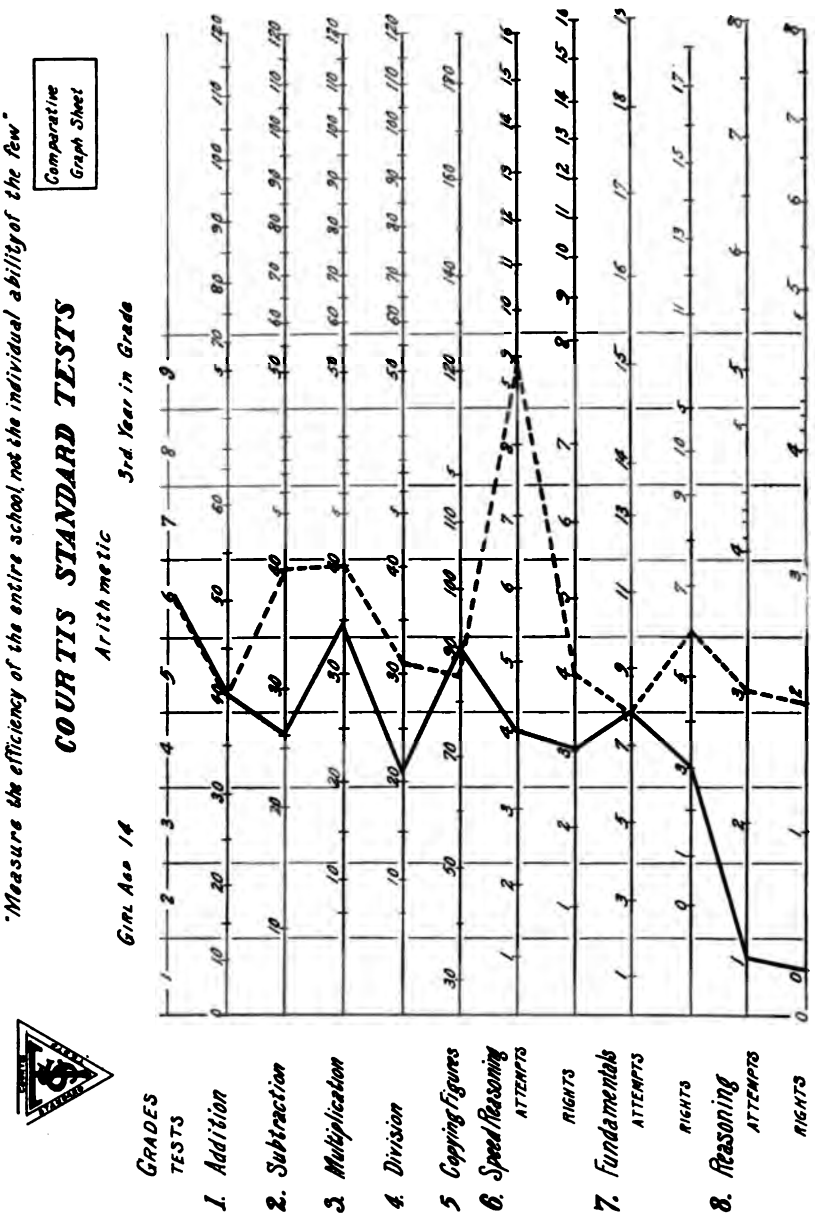

"Measure the efficiency of the entire school, not the individual ability of the few"
Comparative Graph Sheet
COURTIS STANDARD TESTS
Arithmetic
Girl Age 14
3rd. Year in Grade
GRADES
TESTS
1. Addition
2. Subtraction
3. Multiplication
4. Division
5 Copying Figures
6. Speed Reasoning
ATTEMPTS
RIGHTS
7. Fundamentals
ATTEMPTS
RIGHTS
8. Reasoning
ATTEMPTS
RIGHTS

FIG. 34

when it falls to a minimum. There are forces acting which produce marked variations in scale.

That record was taken on May 12 (indicating). Here is a similar test, the same man, taken May 16. You notice on this day the addition and the multiplication were taken at the same time, and on this the addition and multiplication were taken at different times. You cannot follow the general trend very plainly on account of the minor variation; but you notice, if you follow my pointer, it is something like this (indicating); you will have a steady increase up here, and then a decrease, and another increase.

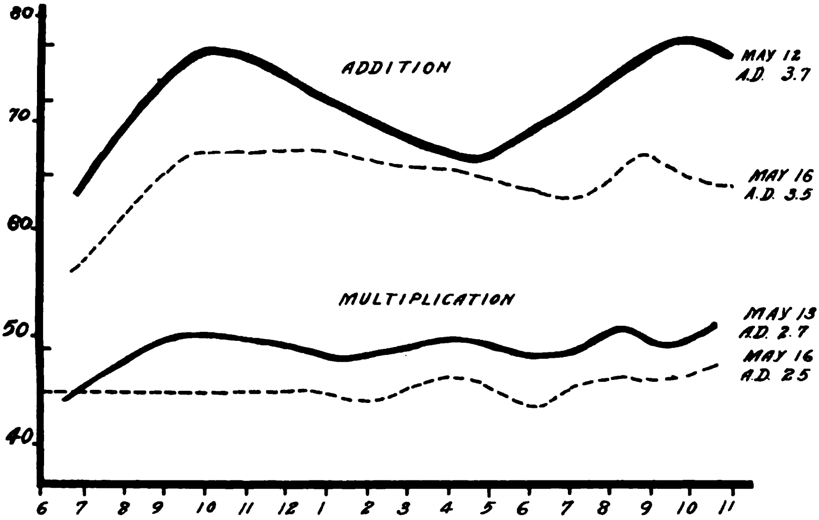


FIG. 35

In the next slide (Fig. 35) I have omitted the details and drawn only the general curve. We get a result something like this: The person began to work low. There is a period of working up towards the maximum, a decrease, and then a second maximum again. Notice that the general condition is repeated the next day. Look at this curve (indicating). See how closely these curves, taken on different days, show the same variations. They show that there are factors at work of which we ordinarily know nothing in the school room. When a child varies up and down in score from one day to another, that fact is significant. You must find out the reason for the variation. It is not enough to say the child is variable in its performance. Let us find out the reason why, and learn how to control it.

What happens when you give the test and then repeat the test immediately afterwards? Will you get the same scores, or will you get different scores? How reliable are such scores? How well will a child repeat his performance the second time? The answer is shown on this chart of addition attempts (Fig. 36), where each arrow represents the score of one of a group of girls in the training school. The average age is nineteen. We have thirty-six girls all together, and these arrows show the changes on two repetitions of this test. That is a test made wholly on examples of this type (indicating). Notice that the median score of the class the first time is fifteen and no tenths example, and that repeating the test gives a median score of two-tenths of an example more. Notice also the individual response of these two girls (indicating). They both had twenty-four examples right both times. There is another one making the same score on the second as on the first trial (indicating). Here

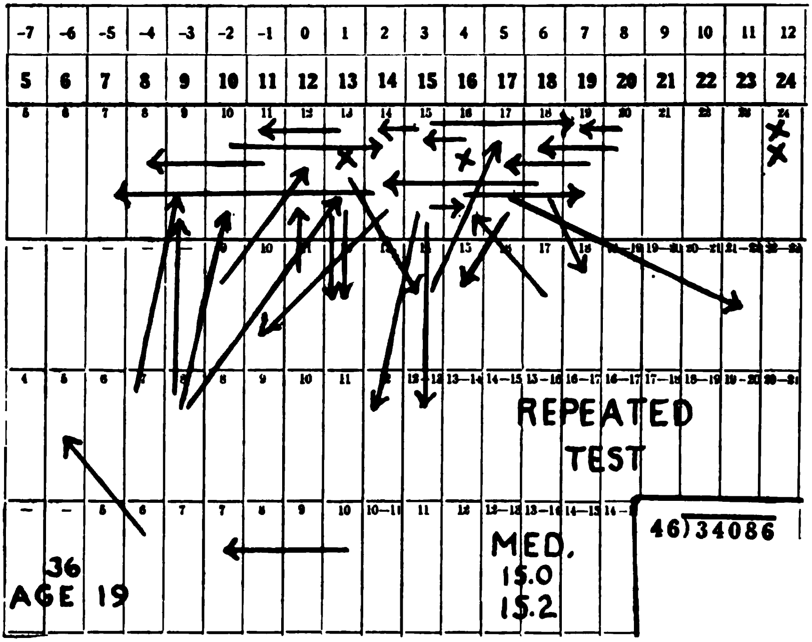


FIG. 36

are other arrows indicating other types of response. This girl did much better the second time; this one did worse. This one had a very big loss. You see the variation in response of different individuals. Some do worse, some do better; some do the same on the second test. You cannot predict at all what any one individual will do. In one sense every test is absolutely unreliable, because you cannot predict what the person will do on the next test; but in another sense every test is absolutely reliable, because if under one certain set of conditions a certain score is shown, as long as those conditions remain, the same score will be made. About sixty percent of the children will vary somewhat from the first score. About forty percent will make very closely the same score. Here is a girl, for instance, whose score varies widely. The first time fourteen and fourteen. The second time she tried only seven. When that score was written, and this score was written, her ability must have been the same. Yet one or the other of these scores is unreliable. There are only two out of the thirty-six that had such a wide variation.

You can see from these records that the response of each individual is determined by factors within that individual, and not by the conditions of the test. For eighty percent of the children the tests are absolutely reliable, but for from ten to twenty percent they are unreliable. For groups, however, the results are very constant, and the fear that some people have that mere repetition of a test will change results widely has little foundation in fact.

Consider the question of individual variation a little further. What happens during the year as you teach a class? Fig. 37 is the record for a whole year of individuals tested repeatedly with the same test thruout the year. We cannot follow it all, but I want you to notice this. We began the school in September. This (indicating) is the Christmas vacation. This (indicating) is the April vacation. This the summer vacation. This heavy line here represents the general progress of the class as determined by the average score. Here is an individual whose curve starts here and makes a steady growth; during the vacation it drops a little, and then goes up pretty high. This is the kind of curve that represents the popular conception of what happens when a child goes to school.

I want to show you other individuals, however. For instance, this one who makes a steady gain during the school term; goes home during the Christmas vacation, and comes back here regular (indicating). Comes into school again and goes home again (in-

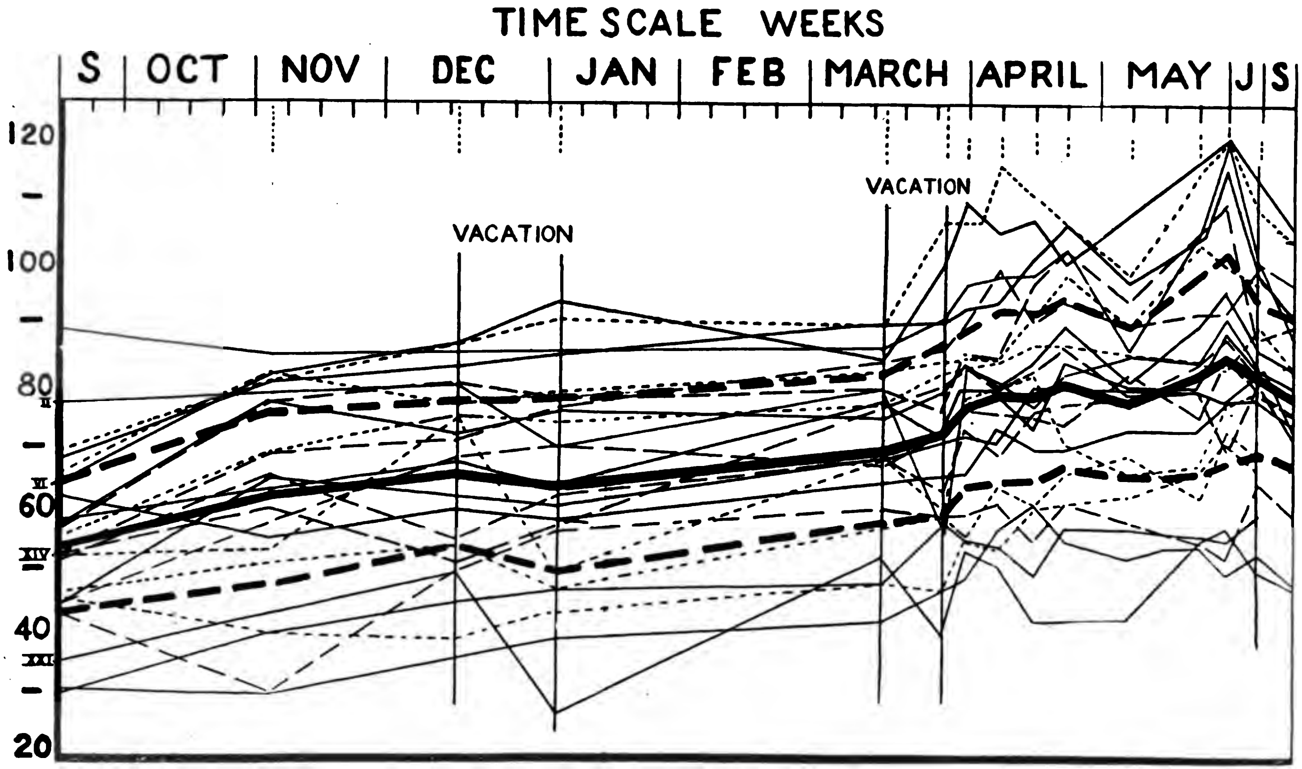

TIME SCALE WEEKS
S
OCT
NOV
DEC
JAN
FEB
MARCH
APRIL
MAY
J
S
VACATION
VACATION
120
100
80
II
VI
60
XIV
40
XXI
20

FIG. 37

dicating). If we could only keep her in school we could probably get her somewhere. The social attractions, or distractions, at home are too great for permanent results.

Just notice the effect of these variations in addition. You see how each child is responding in his own way. There is not a single situation where you can say that the children all respond the same way. The individual variation is too great.

I presume nothing that I can say can possibly convey to you an understanding of the extent of this specialization of the individual mind. It is only as you have worked with children and measured them in many ways that the conviction finally comes that each child is *really different from every other child.* Take the case of response to these division combinations. Fig. 38 is nine divided by three. How long does it take to write the answer and move your hand over to thirty-two divided by eight? What is the relative difficulty of these different divisions?

For this test we used an electric pencil that made a tracing like this (indicating). You can see the top line is marked off into seconds; each mark is just one second apart. Here is the time when a person is writing three. Here is the space for eight; the time a person is writing eight. These spaces are easily meas-used so that in the lower part of the diagram we have the record

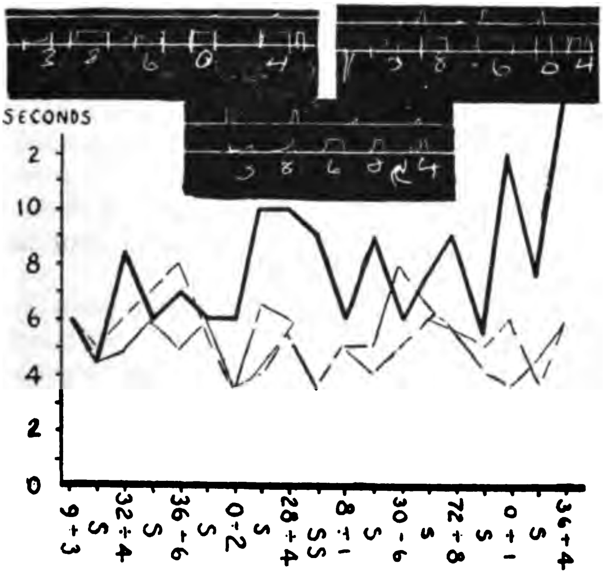


FIG. 38

in seconds. Following this heavy line you will find it took the person six-tenths of a second to write three. It took forty-five hundredths of a second to think of eight, and then about the same time to write it; and so on thru.

You notice that something happened here (indicating). See what it is. Coming to the combination of zero divided by two, he had to substitute a conscious response, in place of an automatic response and it disturbs his whole thinking machinery to such an extent that his reaction time increased greatly. You see the same thing happened here (indicating).

Now, if you will compare these other curves which represent three individuals—I think that line (indicating) is my own—you will find that each of us has his own record, his own peculiarities; and these peculiarities persist thru many weeks. It is not a chance thing, but a regular thing. All of you have your own peculiar difficulties with these different combinations, and would respond in your own peculiar way. What makes this, I don't know. I have some idea about it, but I cannot stop for that now.

The point is that as a general rule the person's reaction along the heavy line is about six-tenths of a second; but you see there are variations from it, and those variations occur for different people in different places. No two combinations have the same relative difficulty for different people.

So, when you have a child who fails to do any kind of work it is not enough to give a snap judgment, an off-hand reason. Each case calls for careful scrutiny. Take the question of failing in column addition. If you go into a classroom you often find there, by actual tests, children who cannot add examples like this (indicating); and nine times out of ten the teacher says the child does not know his combinations; that the child needs to study his tables. I used to think so, but it is very easy to prove that almost all such work done on tables is waste effort.

We have a test for the fundamental combinations in addition like this (indicating). We want to know how many answers per minute a person can write, and here is a scale which represents the number of answers per minute in such test. Then we try the same person on these long column addition examples. Is there any connection between ability in the combinations and ability in column addition? Let us see what the results show. Here are two individuals: one did forty-one and the other forty-four answers per minute in the combination test. One is able to do eleven of the long examples and have nine right. The other has five only and but one right.

Graphically, it is like this: This is the score of one; this is the score of the other. Then look at the curves of these two other individuals. Their scores in the combinations are sixty-two and sixty-three. That is this point on the scale (indicating); but this one does very poorly on the long columns while the other one has nineteen tried and nineteen right.

Look at this one who is able to write combinations at the rate of eighty-seven. He tried only sixteen and had only six right. Do you suppose it would do him any good to study his tables any more? Not a bit.

Do not misunderstand me. Everybody has to learn the combinations. There is no mistake about that. The only question is how they are to be learned, and the results here, in connection with other measurements, show very plainly that it is a waste of time to teach children their combinations in tables. There is only one efficient way for children to learn the combinations, and that is by practice in column addition. The child that does not know the combinations can learn the combinations right in the column addition work; not by working on the combinations as separate tables and later attempting to transfer the skill gained to column addition.

For about seven children out of ten there is little or no transfer. You may teach them a table, but they will not know how to add or to multiply. The teaching must come directly into the situation where the combinations are used. I do not say the combinations must not be taught. They must be. But they must be taught in the situation in which they are used, and not separately as tables. I haven't time to go further now into that. I simply want to point out to you the variation in the organization of different individual minds which results like this indicate. This person does not know his combinations very well, but he is able to add splendidly. This person knows his combinations better than the first, but he is able *to add* very poorly. The difference is due, not to variation in skill in the combinations, but to the differences in the organization of the individual minds.

In one school in New York City we were fortunate in finding twelve pairs of twins in one building. That was too good an opportunity to be lost. We gathered the children in one room and gave them four simple tests of the combinations, over and over again; four trials on each of five tests—this test for addition, subtraction, multiplication, division, and copying figures.

This line represents the average score for the four trials. This curve records the results with two twins who looked alike in their faces. In the first trial both did better than their average. On the second trial both did worse. On the third trial both did better; and on the fourth trial worse. And practically the same thing is true in each test. That is, two individuals who are exactly alike in their minds respond to a given situation in precisely the same way.

These lower curves were drawn from the records of a pair of dissimilar twins, two individuals who are unlike in minds and bodies. Notice that the scores of this one in addition fall off steadily every time he takes the test. That is, the more practice you give him the lower his scores. His twin, however, loses on second trial and then recovers. See the differences between the two in all the tests. They are opposites in their minds and in their behavior.

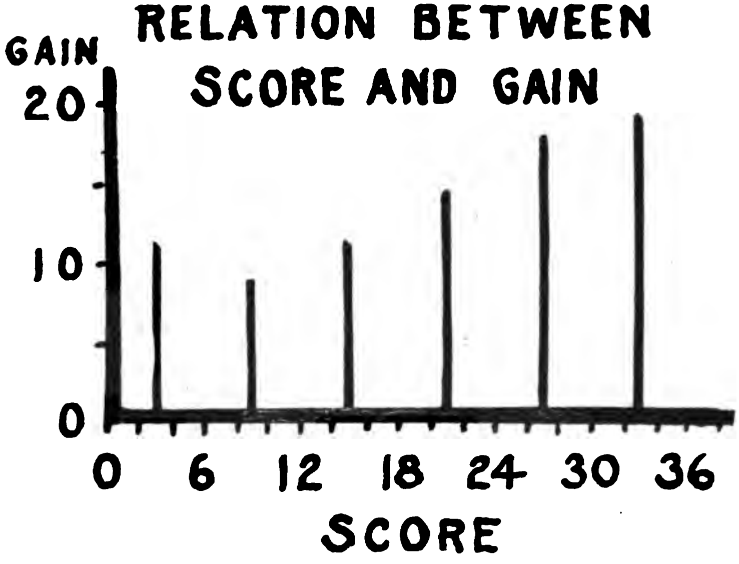


FIG. 39

I want to show you something more than that. Notice that altho this first pair in addition do better on the first trial and poorer on the second, in subtraction they make low scores on the first trial and better on the second. For this individual in the second pair in addition the child's score declines, but the very same kind of practice in division makes that same child's score steadily increase. That is, the method of practice was suitable for division, but was not suitable for that same child in addition.

Thorndike has helped us understand how variable are the capacities of children and their powers of growth. One hundred and ninety-two children practiced in column addition—I think the columns were ten figures long—made these scores (Fig. 39). They practiced for something like a hundred and twenty minutes divided into various periods. Incidentally, in that study Thorndike tried to find out the relation between initial capacity and powers of growth. Here, for instance, are children who could, at the beginning of the experiment, work only about six, from zero to six, of the examples in the time allowed. At the other end of the scale are children who at the beginning of the experiment could add from thirty to thirty-six examples in the time. If you take two groups and give them the same practice, what will be their response? Which group would grow the more, those who are now able to add, or those who do not know how to add?

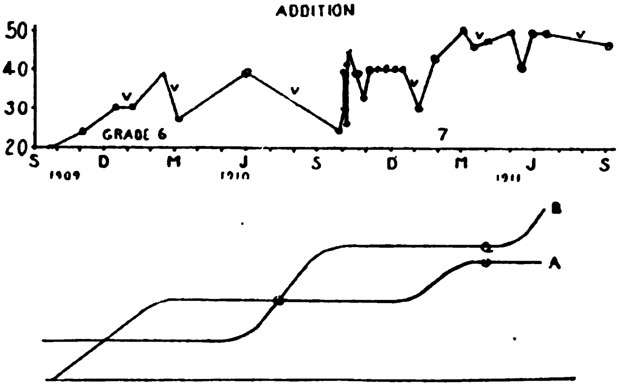


FIG. 40

Look here (indicating). This scale shows the gain. These children (poor) made a gain of about ten examples. These children who already knew how to add made a very big gain; that is, the more able children have the greater powers of growth. This means that if you have a class which has in it children who do not know the multiplication tables, and you give that class drill in multiplication, it is not the children who need the drill that get the benefit of that drill, but it is the children who already have high scores.

The situation is exactly like that we have in churches on the Sunday that the minister gets up and lectures the people who are present on the evils of not going to church. It is not the people who go to church who need the sermon. That is precisely the thing many of you are doing with your classes over and over again. It is one of the things which makes for inefficient teaching, one of the mistakes to avoid.

Not only do children differ in their inherited capacities, not only do they differ in their powers of growth, but they differ in their periods of growth as well. In Fig. 40 I want to show you the record of a child thru two or three years of work. The tests were in addition. At the beginning of the record the child had a score of about twenty, and as the test went on you see there was a steady growth up to a score of about forty. Then there is a variation from that on. Then thru vacation up to this point (indicating) practically no growth from forty. The spring vacation was disastrous, and the record comes down to this level (indicating), but it soon recovers. Thru his stretch (indicating) there is a period of six weeks when the child made a score of forty each week. At this point the scores suddenly went up to a new level, and they hold that level pretty well thru that year and the year that follows. If we generalize that curve, we get something like this: a period of progress following a plateau, then another period of progress and a second plateau.

Suppose we take two children on a certain day, measure them, and find that both children measure forty. One might suppose it would be possible to treat the two children alike. Yet one of those children may respond to training in such a way that in a short time his score will be sixty; but the other child may resist training for a year or more. As an essential part of our preparation we need to determine whether or not the child is ready to grow, whether he is in proper condition for training; for it seems quite likely that this plateau means that the conditions of training were unfavorable. That is, if the training were interrupted at this point, and the test given once a week, or once a month, the plateau could be avoided, and we could get a result which would run up this way (indicating). That matter is under experimental consideration. I can make no final statement about it except that it is probable that such plateaus are not necessary.

We teachers have great faith in our professional training, great faith in our methods—a faith which is not warranted by any of the results so far secured. In one school in a large eastern city we found a master who was a firm believer in the value of the Austrian subtraction. That, you remember, is the subtraction where the remainder is found by addition. If a child wants to find the difference between seven and ten, he thinks how much must be added to seven to make ten. The advocates of that method say that the child does not need anything new after he has learned his addition combination. He already knows how to subtract.

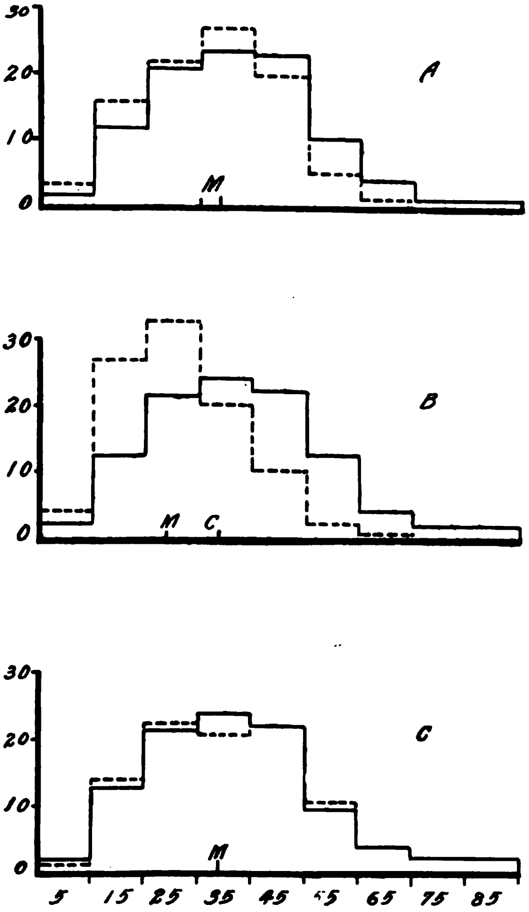


FIG. 41

We tested that. Fig. 41 is the result of the test in subtraction. This scale gives the number of subtractions worked per minute. The solid line (Fig. 41C) shows the results for the city as a whole. This dotted line shows the school in relation to the city. You see that the two curves agree closely. That is, the school's results on the whole were just average.

Fig. 41B is the record from another school where there was poor supervision (indicating). I give this merely to show that the tests reflect any actual differences in schools that may exist.

Fig. 41A is another school that didn't teach Austrian subtraction. Notice that its results are slightly better than those of the school with the special method. So that similar results were obtained by different methods, and the Austrian method did not prove more effective than the other. In general it is easy to prove that differences in method are relatively unimportant.

Suppose we take a picture of the child's mind as completely as we can get it. Fig. 42 is the record of a single girl in twenty-four different tests. The heavy circle represents the sixth grade averages in the twenty-four tests. This waving line represents one year's departure from the sixth-grade averages as furnished by the average scores in other grades. This curve ought to mean to you that this girl was a year older than her grade; about two years taller, half a year heavier, had a year's greater lung capacity, half a year under standard in grip; about normal in her rate of motor activity, but a very slow reader. On careful reading she is up to standard, but on quick reading she is slow; she is deficient in visual memory, and very poor on her rate of English composition. But when you come to arithmetic you find she is very strong, especially on reasoning. I want you to note that the general tendency of that girl is along this line (indicating).

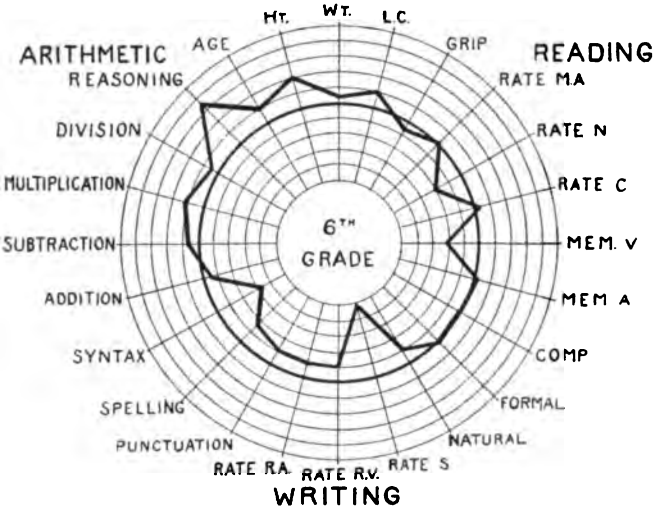


FIG. 42

On Fig. 43 we have four other individuals. You can see how variable are their abilities in these twenty-four tests. That break in the curve (indicating) tells me why I was not able to teach that girl reasoning in arithmetic; she had the serious defect in her ability to read. See how this one is entirely within the circle. You could easily pick her out as the weakest girl in the class, just as you would pick this one out as the strongest. So that you have a means of diagnosis, when you get measures of this sort.

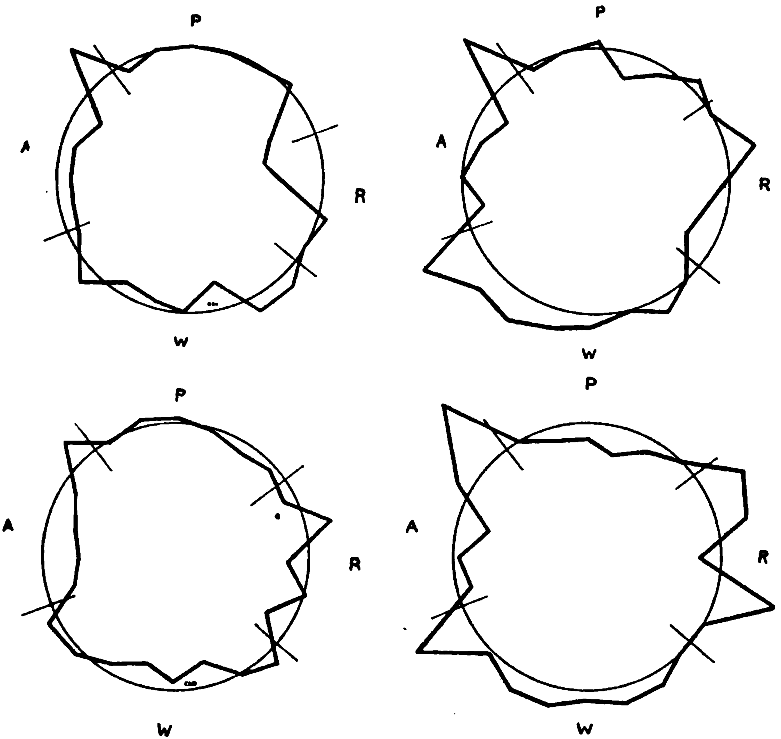


FIG. 43

But the thing I want to call your attention to is merely the differences between these different individuals. You see how different, how specialized is the material upon which the educational process acts.

Now what is the result when we try to teach, absolutely disregarding the children's condition, and measuring our results *merely* at the end of the process? If we do that, what kind of results shall we get? Your own figures for Indiana have shown you.

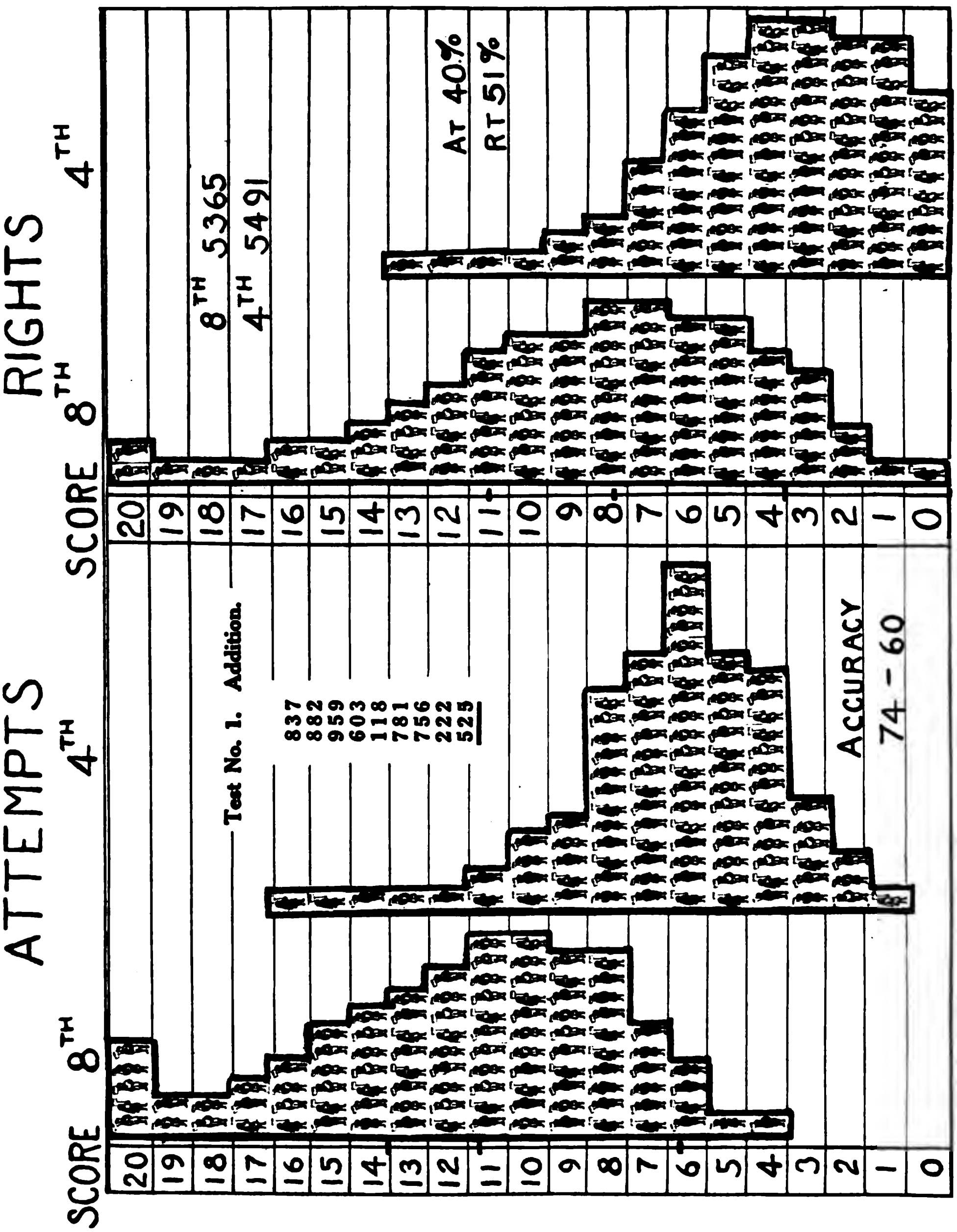

ATTEMPTS
8TH
4TH
SCORE
RIGHTS
8TH
4TH
SCORE
20
19
18
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
Test No. 1. Addition.
837
882
959
603
118
781
756
222
525
ACCURACY
74 - 60
8TH 5365
4TH 5491
AT 40%
RT 51%

Fig. 44

Fig. 44 is an addition test, made wholly on examples of this type (pointing to column in the chart headed "Test No. 1—Addition"). We find that about five percent of the children are able to do twenty examples or more in eighth grade in eight minutes. The product varies down to about one percent of the children who try but four. If we consider accuracy, the product varies from two percent that can get twenty examples right, down to one percent who can get none. Just note the range of variation in the product. That result is representative of the Indiana product, of what you are turning out from your schools at present. If you take children in the fourth grade and compare them with the children in the eighth who made the same scores, you will find that about fifty-one percent of the children could be transferred from the fourth grade to the eighth and vice versa without changing the median scores of either grade in the slightest. That is, the product of school training in addition at the present time is tremendously variable. You will remember that those superintendents came up to about here (indicating 16 examples); bookkeepers and other people of that class came up to about there (indicating 20 examples); and thus all these children had comparatively adult ability. In the eighth grade, on the other hand, you have children who fall below the fourth-grade level. You have four or five percent of eighth-grade children that made lower scores than the average of the fourth grade. That is, when a child says he has completed the work in the schools thru the eighth grade you can tell nothing about his ability in addition. He may be very skillful, or helplessly incompetent.

Precisely the same thing is true in every subject that has yet been tested. Fig. 45 is a question of reading in the eighth grade. One hundred and sixty-three children collected from classes in, I think, five different cities average in the rate of reading from four hundred words per minute down to forty words per minute on the same material, under the same conditions. This (M4) is the fourth-grade average, that (M8) is eighth-grade average. The difference represents four years' work and is about one-third the range in the eighth grade alone. You see what an ungraded class that eighth grade is.

The graph headed "Writing" is an examination on English composition. Here (M4) is the fourth grade average. In that grade it varies from twenty-eight words per minute down to four words per minute.

If you take it in reproduction it is a little better. You see that the difference between the fourth and eighth grades is wider. But even here you have a range of from thirty-four words down to seven words per minute.

In spelling we have a similar range. Taking this English composition, which is the only true measure of spelling, we will find that there was only about ten percent of four hundred and fifty-three eighth-grade children who were able to write one hundred words of their own choosing in this original story without making a mistake; and you will find that the median score here is about three words per hundred misspelled, while there are children who make mistakes on fourteen words. This (M4) is the fourth-grade average, this (M8) eighth-grade average. You see that in all these tests we get this same story of a tremendously wide range in the abilities of the children after they have been under our care for eight or nine years.

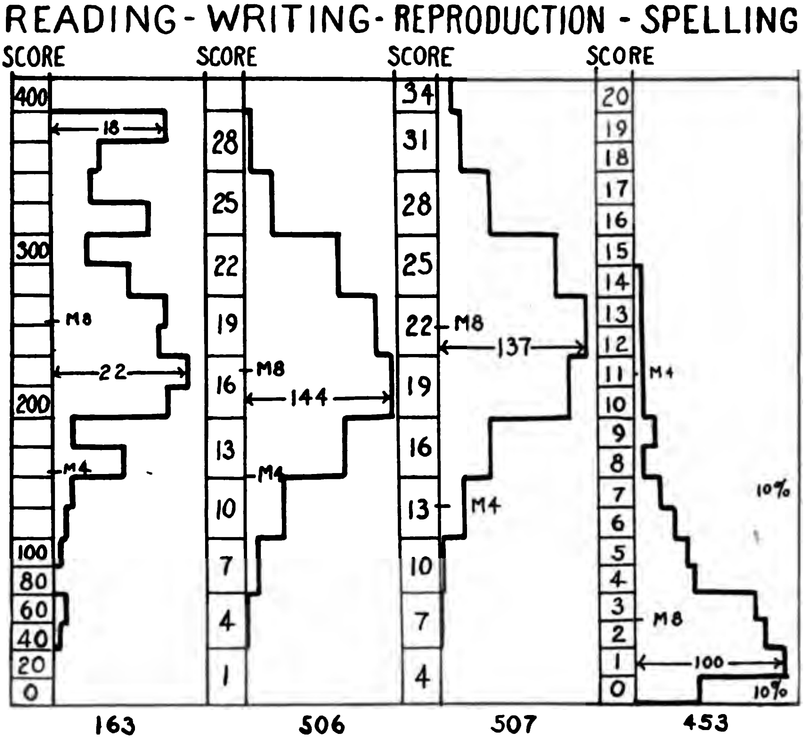


FIG. 45

When we first got such results some people thought they could not be true, that there must be some mistake somewhere; but at the present time the tests have been given in so many cities and given not only at the end of the year but at the beginning of the year also, so that we have measures of growth as well. Fig. 46 shows the growth. This line represents accuracy; this, speed. Each arrow represents one child. Those had greater speed; those had less; those had greater accuracy, and those had less.

That (indicating) is one child who after six months tried seven examples less than he did before, and had seven less right.

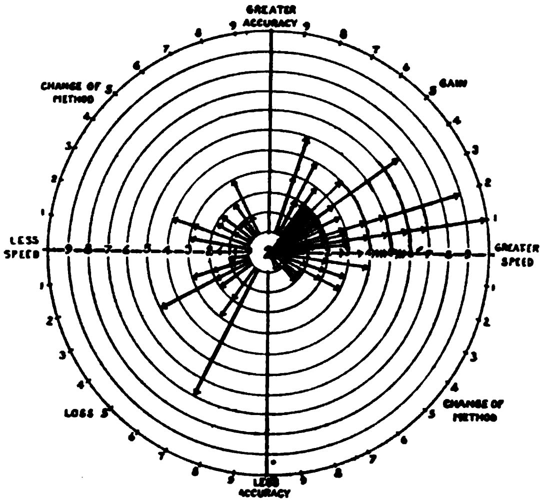


FIG. 46

This arrow means that there was one child who tried nine examples more and had more right. You see how variable are the responses of the children. About twenty percent are losing. You get about thirty percent more standing still. We have about twenty-five percent who are gaining, and from fifteen to twenty-five making satisfactory progress. That is true in city after city and I doubt not at all that your tests in this State will show a similar condition.

Now of course these things I have been showing you mean that the school work as at present conducted is tremendously inefficient. I estimate the efficiency at from fifteen to twenty percent; that is, about fifteen children out of a hundred get the benefit from their school work that they really might be expected to get from the number of hours that they spend in school. Some people find that discouraging. You ought not to. Every test which has been made tends to show that never in the history of schools have the schools been conducted more efficiently than at present. Take the results shown in this slide and other results of the same character—you probably know about the Springfield test. In this case, Norwich, Conn., examination papers were found that had been given in 1862. They were given in the same schools in 1909, scored in the same fashion, and to the same grades of children. Those scores (indicating) represent the scores made in history and geography and grammar in 1862. Our present score in 1909 is up there (indicating). And what is more, the average age of our children is fourteen, and then the average age of the class was fifteen. There is nothing to be discouraged about in that. It simply means that our work has been conditioned by factors about which we knew nothing, and could not know until we had a means of measurement.

To my mind the inefficiency of the school is simply an opportunity for making a great contribution to the progress of our work. It is a call to service. I do not see why anybody should be discouraged as long as it is not our fault. It will be our fault if we go on doing the same old things when we have the means of doing better; but the present conditions are not a reflection upon anybody at the present time. We could not do any better until we had measurements. The savage man, the cave man, did not do very well in the construction of their crude machines before they had units of measurement; neither can we do well in education until we get units of measurement; but when we get them you will find these curves will go steadily upward. You will find not a little advance here and there, but a great advance and a great increase in the efficiency of the schools.

What about the program for efficient teaching? I am glad to say that at the present time we have worked around until we have a very definite program upon which we are basing our constructive work, and that program is here before you. The first thing is, as I am trying to make plain, that we must define in objective terms precisely what we are working for. The second thing is that we must accept the doctrine of limitation of training, which goes with definition of aim. The third one is that we must recognize individual differences in children and adjust our work in accordance with those differences. If we do that it will call for a specialization of training for each child.

And then we need to find out exactly what is the matter with each child that does not grow and apply the proper remedies. When we come to drill work, we must divide the work properly between the teacher and the class. The children must do the work and not the teacher. That is, we must have a self-direction of drill work.

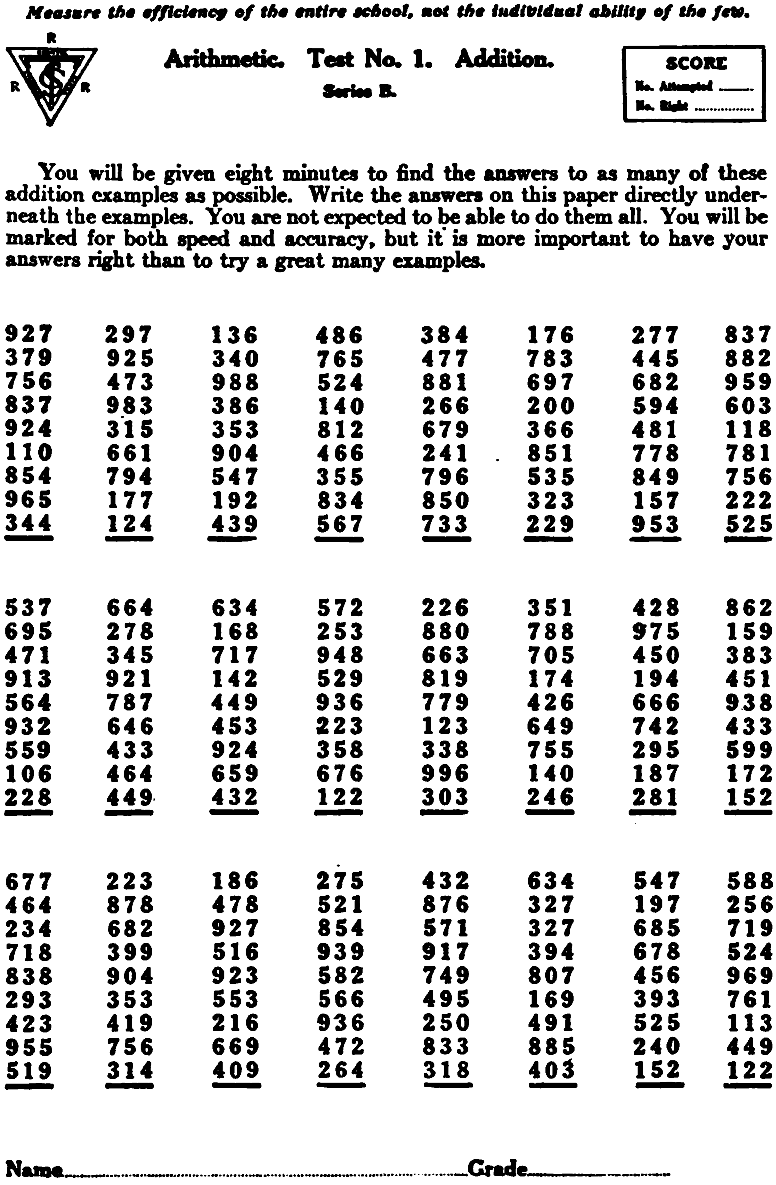
Now of course the point of "definition of aim" is the most important one at the present time, because the first step is to have a clear idea of what is to be accomplished. Each aim in the school work should be stated in objective terms, so that no one can misunderstand what is wanted. If I say for the eighth grade that in June fifty percent of the class ought to be able to do twelve of those addition examples (Fig. 47) and have all twelve right I have given an aim that is perfectly definite.

I don't know how many should be right, and I put it at one hundred percent until I find out. I am not saying that twelve is right. If you chose to set it at nine here in Indiana that is your concern. Boston has set its own standard. In Detroit we have adopted twelve, and a hundred percent accuracy as the goal toward which we are working; and I expect to see an efficiency in a year or two of sixty or seventy percent on that basis.

Now when we have standards of that kind and then we find a girl in a class where the class has a record like this (Fig. 48, irregular broken line) and the girl has a record like this (Fig. 48, solid line), which means that she is very strong on multiplication, away above the class, but very weak on subtraction, we must invent methods which will enable us to specialize the training, and excuse her from multiplication in order to build up on subtraction; give her just the work she needs; not the work the class is doing.

This girl is away below the class. She needs first-grade work, even if she is in the seventh grade in subtraction. We must give her the work within her power until we build her up to the class. The minute we do that we get results like this (Fig. 49), where we have a uniform product; uniform because we have adjusted the training to the individual needs; not uniform because we compelled the child to conform to an arbitrary standard.

Now how are you going to handle, how is the teacher going to take fifty children, make a change in the method to be followed in addition, subtraction, multiplication, and division, if necessary, and vary the training according to the conditions of growth of the child and its inherent capacity?



Measure the efficiency of the entire school, not the individual ability of the few.

Arithmetic. Test No. 1. Addition.

Series B.

SCORE
No. Attempted ....
No. Right ....

You will be given eight minutes to find the answers to as many of these addition examples as possible. Write the answers on this paper directly underneath the examples. You are not expected to be able to do them all. You will be marked for both speed and accuracy, but it is more important to have your answers right than to try a great many examples.

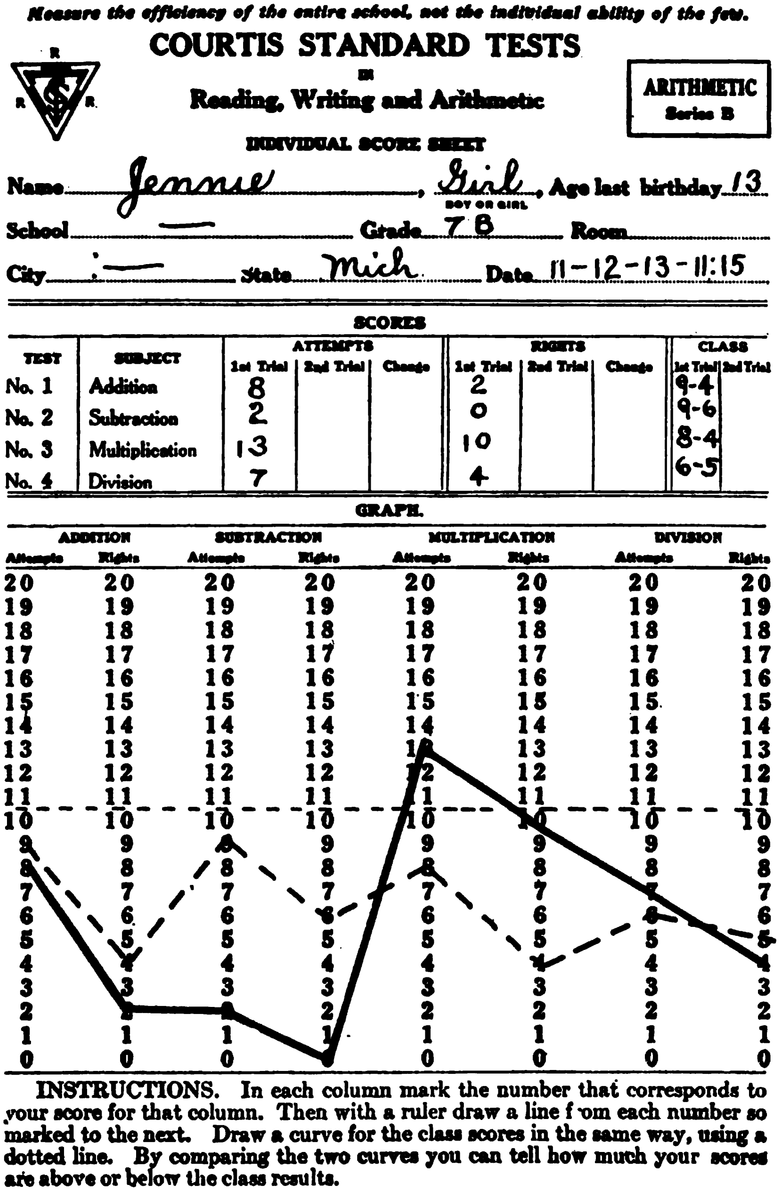
927	297	136	486	384	176	277	837
379	925	340	765	477	783	445	882
756	473	988	524	881	697	682	959
837	983	386	140	266	200	594	603
924	315	353	812	679	366	481	118
110	661	904	466	241	851	778	781
854	794	547	355	796	535	849	756
965	177	192	834	850	323	157	222
344	124	439	567	733	229	953	525

537	664	634	572	226	351	428	862
695	278	168	253	880	788	975	159
471	345	717	948	663	705	450	383
913	921	142	529	819	174	194	451
564	787	449	936	779	426	666	938
932	646	453	223	123	649	742	433
559	433	924	358	338	755	295	599
106	464	659	676	996	140	187	172
228	449	432	122	303	246	281	152

677	223	186	275	432	634	547	588
464	878	478	521	876	327	197	256
234	682	927	854	571	327	685	719
718	399	516	939	917	394	678	524
838	904	923	582	749	807	456	969
293	353	553	566	495	169	393	761
423	419	216	936	250	491	525	113
955	756	669	472	833	885	240	449
519	314	409	264	318	403	152	122

Name..Grade....................

FIG. 47



Measure the efficiency of the entire school, not the individual ability of the few.

COURTIS STANDARD TESTS

IN

Reading, Writing and Arithmetic

ARITHMETIC
Series B

INDIVIDUAL SCORE SHEET

Name Jennie , Girl , Age last birthday 13
BOY OR GIRL

School — Grade 7 B Room

City — State Mich Date 11-12-13-11:15

SCORES

TEST	SUBJECT	ATTEMPTS 1st Trial	ATTEMPTS 2nd Trial	ATTEMPTS Change	RIGHTS 1st Trial	RIGHTS 2nd Trial	RIGHTS Change	CLASS 1st Trial	CLASS 2nd Trial
No. 1	Addition	8			2			9-4	
No. 2	Subtraction	2			0			9-6	
No. 3	Multiplication	13			10			8-4	
No. 4	Division	7			4			6-5	

GRAPH

ADDITION Attempts	ADDITION Rights	SUBTRACTION Attempts	SUBTRACTION Rights	MULTIPLICATION Attempts	MULTIPLICATION Rights	DIVISION Attempts	DIVISION Rights
20	20	20	20	20	20	20	20
19	19	19	19	19	19	19	19
18	18	18	18	18	18	18	18
17	17	17	17	17	17	17	17
16	16	16	16	16	16	16	16
15	15	15	15	15	15	15	15
14	14	14	14	14	14	14	14
13	13	13	13	13	13	13	13
12	12	12	12	12	12	12	12
11	11	11	11	11	11	11	11
10	10	10	10	10	10	10	10
9	9	9	9	9	9	9	9
8	8	8	8	8	8	8	8
7	7	7	7	7	7	7	7
6	6	6	6	6	6	6	6
5	5	5	5	5	5	5	5
4	4	4	4	4	4	4	4
3	3	3	3	3	3	3	3
2	2	2	2	2	2	2	2
1	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0

INSTRUCTIONS. In each column mark the number that corresponds to your score for that column. Then with a ruler draw a line from each number so marked to the next. Draw a curve for the class scores in the same way, using a dotted line. By comparing the two curves you can tell how much your scores are above or below the class results.

FIG. 48

We know right away it is absolutely impossible, and these results very often seem staggering to people who consider this problem for the first time. But really it is not as bad as it seems. It is simple of solution. Why not let the children choose their own method? Are you willing that I should dictate what you should eat, for instance, this coming week? Will you let me select your reading, or any other one of those things which you personally choose? Let the children decide the same way. Put here before them a perfectly definite task and let them work towards it.

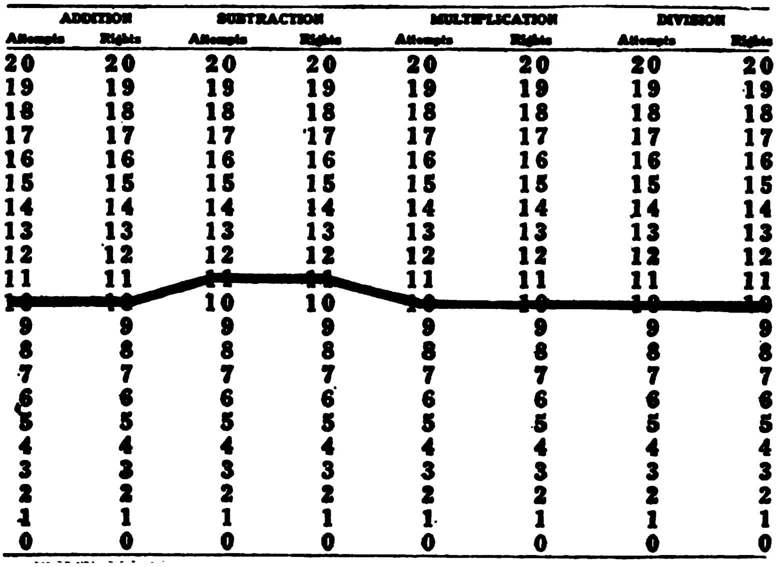


FIG. 49

COURTIS STANDARD PRACTICE TESTS. LESSON NO. 1—ADDITION

				5					10		
6	8	4	2	5	6	4	3	4	4	9	5
3	4	7	4	0	7	2	6	9	2	6	0
1	7	4	6	2	5	3	8	6	9	8	6
–	–	–	–	–	–	–	–	–	–	–	–
		15					20				
1	8	3	7	7	1	5	5	5	1	8	7
8	1	4	2	0	7	2	1	9	3	7	5
3	5	9	4	1	7	6	9	2	9	8	2
–	–	–	–	–	–	–	–	–	–	–	–
25					30					35	
6	5	3	7	8	1	6	8	6	4	3	7
5	2	9	5	0	8	7	1	2	8	8	6
5	6	8	4	8	9	6	3	1	5	7	6
–	–	–	–	–	–	–	–	–	–	–	–
			40					45			
9	7	4	9	9	5	5	2	4	7	3	8
3	0	4	7	6	6	1	4	5	2	9	9
2	4	8	3	5	9	6	8	9	8	9	3
–	–	–	–	–	–	–	–	–	–	–	–
	50					55					60
4	3	4	5	9	4	4	1	5	9	6	5
7	4	9	1	7	9	3	3	1	2	5	4
4	8	7	8	0	3	1	8	5	3	8	7
–	–	–	–	–	–	–	–	–	–	–	–
				65					70		
8	9	5	8	5	3	3	5	9	1	3	8
4	3	0	8	3	6	3	6	7	6	9	6
0	6	8	5	2	4	1	8	5	7	4	0
–	–	–	–	–	–	–	–	–	–	–	–

The foregoing test, for instance, is the thing we give the children in the eighth grade in Detroit. We say they ought to be able to do those examples in three minutes and have every one right. In the fourth grade we give them six minutes, but they must have every one right. The first day everybody in the class takes that test. Those who are successful may go on immediately to Lesson No. 2, the test in subtraction.

COURTIS STANDARD PRACTICE TESTS. LESSON NO. 2—SUBTRACTION

19 6	32 7	14 2	32 3	12 2	23 9	35 7	13 1	31 4
15 5	17 2	33 7	19 8	30 2	27 7	16 2	26 7	26 5
21 8	37 9	12 1	29 5	25 9	28 1	18 3	27 6	26 8
29 9	18 5	31 6	20 9	32 6	14 4	17 3	37 8	24 7
13 2	38 8	31 7	27 5	21 5	19 1	24 5	14 3	30 3
21 2	33 8	20 1	29 3	32 4	15 4	26 6	30 6	
18 2	28 9	14 1	29 4	11 1	32 9	23 6	15 1	

Those who are not successful have to stay on the addition test until they know how to do it successfully. That is, to get every example right, that is, do thoroly the work that they are doing and do it within the time. Thus we control both speed and accuracy.

Some people object to letting the child take that test and work on it. Why, they say, he will learn it by heart. That is what I want him to do. I want an adder who has learned so many examples by heart that you cannot give him a new one he cannot add immediately. In this case, he meets a new series of combinations in lesson four—the same combinations, but a new arrangement. In lesson seven he comes to addition again. There are fifteen different types of addition problems. When he has finished the series of forty-eight lessons he will have developed himself in all of those different operations.

Each child keeps a record of his own work, traces his records from day to day. Here (Fig. 50) are graphs of the records of a number of children. This is a curve of a child who the first day tried only forty-two of the seventy-two examples in the test. Notice that in four days he is thru and ready to begin with lesson two. But this second child was low not only in speed but also in accuracy. That inaccuracy holds until the child realized that he had to master that, and then we come down to a place like this, where he conquers it and goes on to the next test.

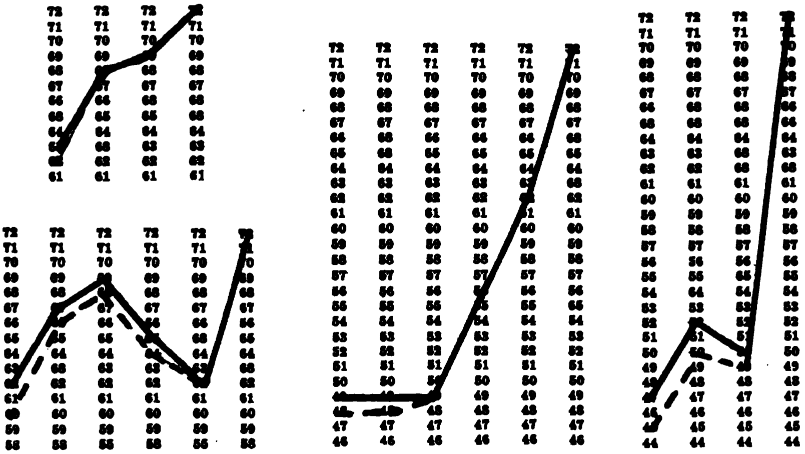


FIG. 50

Look at this one. There is the same situation there. No progress here for three trials. Probably the method at first didn't make much appeal to him. A great many children don't care what the teacher says, but when Johnnie or Susie, or some one else they are interested in, begins to get ahead of them, it is another story. When he does begin to work, even tho he is down at forty-eight, he sees from his graph that he gets his gain in return for his study. This test is such a simple one that it is within his reach.

Do you notice the difference in the individual response? and do you notice now that all the teacher has to do is to say start and stop? Whether the child is working on lesson forty-eight or lesson one, the teacher can have a whole roomful working at different lessons at the same time, each child can go at his own rate, go his own way. If he chooses to study orally or visually, he pursues his own method; and the teacher does not need to see him unless something happens to his record.

If the first study progresses like this (indicating), why should the teacher help? Why should he not be left to help himself? But if the scores become stationary then he needs help.

Here is the record, for instance, of a boy who had a great deal of trouble with lesson 1. I have lots of sympathy for that boy. That is my boy. I picked out a very able woman for his mother, but unfortunately he chose to inherit almost entirely from his daddy; consequently he has all the defects his daddy has, and I know what a struggle it takes to overcome them.

Now that boy was way low. He was fifth from the bottom of nine hundred and sixty-five of fourth-grade children that we tested in addition at Detroit this year. I have his record here (indicating). He was off the map. He was so far below that we had to tack an extension on the graph sheet to get it down low enough for his record. I took that boy and helped him as much as I knew how. I explained what the trouble was. You see the effect of the explanation.

Now that is a common defect in teaching. It does not get "across". There is no way by which you can transmit basic experience by instruction. If we could take our experience at the end of life and give it to the children just starting, the human race would advance at a tremendous rate. But you cannot transmit basic experience by instruction. It is a thing that has to come from within. When I finally came to my senses, I took the matter up with the boy and made plain to him what he needed. He agreed with me that the trouble was want of concentration. I explained it could only be overcome by his own efforts. I gave him a supply of tests and a stop watch. He agreed he would not go out to play that Saturday morning until he had made a definite gain. I don't know how many trials it took. It took about two and one-half hours, and cost some tears, but he made it, and when he went back to school of Monday that is where he was (indicating). Here is another period of stagnation, and another Saturday, and another boost. I didn't do that. The boy did it.

And look, here is the next test. He started low, but it was not long before he began to gain. Then what do you suppose the next thing was? A note came from his teacher, "Joe is improving in all his studies." Why? Because he had learned to concentrate, had mastered the one defect which was standing in the way of all his work.

That effort at concentration was *for him* the critical thing. This case illustrates perfectly what I mean. Teaching does not do any good when you have a difficulty like that to deal with. Whatever causes a difficulty, it must have some remedy which fits the case, and no other. You cannot make your teaching efficient until you become educational physicians, and apply the precise remedy which a child needs.

Do children need this kind of work? Let me show you some results. We had the tests in use in Detroit for sixty-five days. Here are the returns from 2,749. Four hundred and seventy-nine, in sixty-five days, had finished the work of the term, that is, the first twenty-five lessons. There were back here some children, ten or fifteen, who were still on lesson 2. You see the way this distribution runs in here (indicating). About one-third of the children had completed the work for the term. The rest are all the way along the line from two to twenty-four. What are you going to do with a child like that (indicating)? If he has made a gain, every day a little gain, steady progress, if he has done the best he can, and you have done the best you can, and you have arranged conditions, and yet you have only secured a very small growth, what are you going to do? Can you alter the facts any? Can you make a boy six feet tall when by nature he is only four feet? Do you expect him to be fat if nature made him thin? You know better than to try to make those changes. You don't train a bulldog to run, or a greyhound to fight. What we are endeavoring to do here is to give the children such training as will make them do thoro work. They do not go on until they have mastered the elementary things. They do not take the next step until they have mastered the thing preceding it. It makes no difference what grade they are in. They can always take the work that is adjusted to their needs, because the scheme was made for this purpose. The time allowance being the same to them all, they can work under uniform conditions, each at his own particular level.

Now what about the saving of time on this drill work?

Here is a record from an eighth-grade class. This amount of time was saved; about thirteen percent. That is shown easily here (indicating). This base line represents the twenty-four lessons that they were to complete for the term. The line running this way (indicating) represents the sixty-five lessons they had to do. This boy concluded the things he had to do in that amount of time, and he had twenty-one days left for the study of other subjects, when the classes were taking this practice work. You see there is a saving of time for about half the class.

This boy completed only twenty-three lessons; this one twenty-two. This one came in late. He made a start at the beginning when he came in and had worked thru ten. The report at the end of the year is not going to say "Passed", or "Not passed". It is going to specify the degree of ability which has been attained by the school work. The report is going to say he has attained a certain level of ability. If he has gained every day and put forth his best effort, why should we condemn the child?

DETROIT PUBLIC SCHOOLS

Practice Tests in Spelling

LESSON NO. 4—A TRIP TO A GREAT CITY

On the **sixth** of December we left the Green **Mountains** of **Vermont** to visit an uncle, who had just returned from a long **voyage**. He had acquired immense wealth by deals in **leather** and **turpentine**. We were glad to arrive in **Chicago** on the **eleventh** for we had often dreamed of this visit. But how **deceiving** are dreams. Instead of being met at the depot as we expected, we found we did not know a single man or woman in all the great crowd in the station that **e ening**. We had to **argue** with ourselves to try to **understand** how anyone could **disappoint** us on such an **important** occasion.

INSTRUCTIONS: Read the paragraphs above and study the spelling of the words printed in heavy type until you can fill in all the blanks on the other side of this sheet correctly in four minutes.

DETROIT PUBLIC SCHOOLS

Practice Tests in Spelling.

LESSON NO. 4—A TRIP TO A GREAT CITY

On the..............of December we left the 1
Green.........................of.............. 2
................to visit an uncle, who had just 3
returned from a long................... 4
He had acquired immense wealth by deals in 5
.... and 6
We were glad to arrive in..................... 7
on the .... for we had often 8
dreamed of this visit. But how................
..........are dreams. Instead of being met at 9
the depot as we expected, we found we did not
know a single man or woman in all the great
crowd in the station that..................... 10
We had to..................with ourselves to 11
try to.............................how anyone 12
could............................us on such an 13
..........................occasion. 14

Scores......Number Tried......Number Right.....
Name.................... Grade......Room.......

The accompanying test indicates the way we are handling the spelling. A little story is printed on a sheet with the words to be spelled in heavy type. On the other side, the same story is printed with the spelling words left blank. The child writes only words as in a spelling list, yet at the same time the words appear in the natural context. The stunt is to get all the words written in the blanks correctly in four minutes (for the fourth grade). The first day everybody takes the first lesson. The second day those who succeed go on to the second lesson. Now the good spellers, the ten percent who need no training, in twenty days complete the work of the term, and have the remaining days for other work. The poor spellers like my boy take that test fifteen or twenty times before they complete it. This method points out to the teacher where the mistakes are being made, and the teacher is able to pick out the exact remedy which each boy needs. So we find that as a child goes thru with the series he gains in general ability to spell, and in his speed, on each test.

So in writing, we can divide the writing lessons for the term into a series of twenty tests, each three minutes long. Suppose we put the test that the child shall be able to write the word men fifty times in three minutes and in quality as well as this specimen here (indicating). If you want the real value of this,—that is, measured by the Ayres scale or the Thorndyke scale, you can turn it into absolute values, but for classroom use we supply each child with a rough scale, all the same of which are based on the word men so that there will not be difficulty in judging one kind of writing by another.

Suppose the first day a boy does a kind of writing like this (indicating), the next day like this (indicating), and so on. Do you see how, if the good writers are going on in five days to lesson five, and the poor writers are still on lesson one, they have an opportunity to see the relation between their practice exercises and their writing ability? Each day at the beginning of the lesson we have ten minutes practice in which the child chooses his exercises to correspond with the particular need that he has in his writing test. Then at the close of the writing period we have a three-minute test period. We thus get the children testing their practice to see whether it has been effective or not. Just as soon as they complete twenty lessons for the term they are excused from all writing drill. They have that time for other work unless the writing in their English work begins to deteriorate. We find that in this way we can not only save time, but that the children take hold of the work and take a responsibility in it as never before. They are anxious to carry the thing thru and improve their penmanship.

In closing I want to leave with you an ideal. It may not look like much of an ideal, but it has been mine for many years. You will recognize here, for instance, in this heavy line, the distribution of which Dr. Ayres spoke. Here are a few children with very low scores. Here are a few with very high scores. That is the kind of condition we have at present. What happens when we try to teach them, particularly if we try very hard and have had a great deal of training so that we are especially fine teachers? We send some children away up there beyond the level of value in mechanical work. We also send some children lower than they would have been if we had made no special effort. The condition when we get thru is represented by this dotted line (indicating).

In place of that, if you have a definite aim and if you limit training and specialize your training to meet individual needs, you will be able to get a distribution of this kind, where, altho we have in our classes varying abilities, we can have a uniform product and can very much increase the efficiency of our schools. But there are many, many problems to be solved before we can get to that place. That is why I want to enlist the coöperation of the teachers and superintendents of Indiana.

I know that these things are true by your own results. I want to enlist your coöperation in the invention and working out of new methods of class administration, new methods of defining what the ends are we are working for, in order that we may not have one, two, three, or twenty individuals, but many hundreds of minds at work on this problem. I have faith enough in American ingenuity to believe that this problem can be worked out, under the conditions in American public schools. I believe the time is coming when our teaching is going to be three or four times as effective as at present. Can you picture at all what that would mean for our nation? Do you realize that at the present time we have enough information in the world to bring about the millenium in the next generation if we could only make the things that we teach function in the minds of the children? I thank you.

MR. HINES: Is there any further business to come before the conference before the noon recess?

MR. COLLICOTT: Mr. Chairman, I believe these meetings have been so fruitful of profit and we have enjoyed them so much that we should say something to the State University about them, and I have therefore drawn this resolution, and move its adoption:

> Believing that the two annual conferences on Educational Measurements held at this University constitute the most important recent advance in educational work in Indiana, and believing that a continuation of such conferences will prove most fruitful in promoting the scientific study of education thruout the State and in unifying and uplifting the school work, therefore,
>
> Be it resolved, by this body of superintendents, principals, and supervisors, that the University be requested and urged to continue such annual conferences; and that the Bureau of Coöperative Research of the University be urged to extend its studies of scientific measurements and standards to more of the regular school subjects, in order that the work of the public schools may be brought to the highest standards of efficiency.

I move the adoption of the resolution.

The motion was seconded, the motion was agreed to unanimously, and the conference adjourned until afternoon.

SATURDAY AFTERNOON SESSION

The conference was called to order by H. G. Brown, Superintendent of the Lebanon schools, in the absence of Mr. L. J. Montgomery, Superintendent of the South Bend schools, who was to be the presiding officer for the afternoon session.

MR. BROWN: Mr. Montgomery has been delayed for some reason, and I am asked to preside. We will go ahead with the work of this afternoon on the topic "A Survey of School Surveys". Mr. Ayres will discuss the topic.

A SURVEY OF SCHOOL SURVEYS

MR. AYRES: Four years ago two university professors injected a new word into our educational vocabulary and introduced a new method into our educational procedure. In that year Professors Hanus of Harvard and Moore of Yale conducted studies of the school systems of Montclair and East Orange in New Jersey and each used the word "survey" to designate a section of his report.

These earliest of school surveys differed from former reports on school systems in their fundamental philosophy. Their object was to tell the people in simple terms all the salient facts about their public schools, and to rely on the common sense, the common insight, and the common purpose of the people as the first great resource in working out their problem. The purpose of the survey was to educate the public.

The two men who conducted these surveys were pioneers, but not inventors. They did not originate either the new term or the new method. They borrowed them both from the social survey movement which was at that time three years old. This movement had its inception in 1907 in the social survey of Pittsburg which borrowed its name from the land survey.

In the years that have elapsed since these early beginnings, the survey movement has grown with great rapidity, but the social survey has multiplied far faster than the school survey. The Sociological Library of New York City is now compiling a bibliography of the survey reports that have appeared in print and it has shown that while the American social surveys now number more than three hundred, the educational ones are only thirty.

The truth is that the school survey is the direct descendant of the social survey, that the two are contemporaries, and that the parent movement is twice as old and ten times as big as the offspring.

Now surveys of this new sort are always expensive of both time and money, for when rightly conducted they are dependent on truth and simplicity, which are costly. On those that have been carried thru in the past few years, sums of money mounting high into the hundreds of thousands have been expended, and to them thousands of men and women have devoted long periods of the most laborious sort of work and study.

This means that these surveys are the product of some widespread and powerful influence, for nothing is purchased at so great a price except in response to an insistent demand. This influence is not far to seek. It is to be found in one simple idea which has been taking root in the mind of the American people during the past decade and a half and which is shaping the events of the time and determining their ultimate issue. That idea is that people are more important than property.

Ever since this idea was borne in upon the American people, they have been restlessly turning upon themselves and their institutions the merciless eye of self-examination. They are asking what manner of people they really are. They are demanding to know whether justice is being done in America.

The results of this searching self-examination are to be found in the veritable flood of books and reports that have appeared in the past ten years describing the illiterate, the immigrant, the industrious; the plutocrat, the prostitute, the prisoner; the teacher, the tenant, the tramp; and so on thru the alphabet. Every part of our life is being studied, written about, surveyed.

This movement, of which the school survey is a part, is no silent, unconscious transition from one age into another. In no former period has the demand for change been so deliberate, so widespread, upon so great a scale. Education is following where the movement for social justice has led. The American nation is looking itself over from head to foot, critically questioning its very elements, challenging its oldest institutions as well as its newest, studying its every arrangement, analyzing its philosophy, and it stands ready to attempt as many and as radical reconstructions as may be necessary to attain its ends. As a nation we are seeking, and are determined to find, not a place in the sun but a more equal distribution of sunshine in the lives of all the people.

The school survey is a fraction of a fraction of this deliberate self-examination of the full-grown nation. It is here because the people want to know the facts about their schools, and the school survey is the most efficient means yet discovered for finding them out and making them known.

There are certain definite characteristics which set the school survey apart as a distinctive implement of education and of democracy. These characteristics are in large part inherent in its very name which it indirectly takes from the land survey.

The school survey, like the land survey, is always a local study. It is concerned with conditions within a given area. It can never be thought out at a far-away desk. It is not a general treatise on education. It recognizes that each community has its own distinctive problems which must be solved by itself and are not susceptible of absent treatment.

That is why the school survey can never be thoroly standardized. That is why we can never have what many people are insistently demanding—a standard set of forms and schedules to gather for any or all cities, the figures and answers which, when tabulated, will constitute school surveys. The forms, schedules, and scales used in school surveys are like the transits, tables, and chains, used in the land survey. The more accurate they are, the higher will be the quality of result that may be produced. But they do not constitute a survey. They can never be used in just the same way in any two localities, and people do not become skilled in their use save thru long and arduous practice.

Another cardinal characteristic common to the land survey and the school survey is that the surveyors must always be competent. In the former field this has been guaranteed by legal enactment since the days of the ancient Egyptians. In making school surveys it has frequently been forgotten. It is a fundamental fact that in neither field can trustworthy results be obtained thru ready-made methods or untrained common sense. That is why it is generally true that school surveys cannot be conducted by mothers' clubs, newspapers, chambers of commerce, citizens' committees, or local bureaus of municipal research.

A third common characteristic of the land survey and the school survey is that they are both unworthy of the name if they are partisan or prejudiced. To accuse or defend, exaggerate or minimize, is as fatal in the one case as in the other. Surveys must never be like those verbs in Latin that take the dative. They must never have as their purpose to ''please or displease; command, obey; serve, resist; benefit, injure; believe, threaten, persuade, and the like."

This is why the survey is not an investigation. By common usage the term "investigation" suggests the indictment of individuals or institutions. It stresses failure and nonperformance. It looks backward. An investigation implies the existence of conditions known to the insider but unknown to the outsider, which are to be ferreted out and subjected to pitiless publicity. Whenever the land surveyor or the school surveyor conducts his study for the purpose of proving a preconceived case, the product is not a survey nor does it contribute to progress.

To be valid or valuable, both sorts of surveys must be scientific and both must ever remember that science is not a body of doctrine but a method and its object is the pursuit of truth. This method is at base analytic scrutiny, exact measuring, careful recording, and judgment on the basis of observed fact.

In both fields the demands of good workmanship require that the record shall show the steps whereby the conclusions were reached. All must be capable of verification so that another competent surveyor going over the same ground could check all the steps and verify the conclusions. When the surveyor steps off the sound pier of fact into the uncertain bog of speculation, he steps into trouble. This has at times been overlooked in the conduct of surveys.

On the social side, the school survey has two sets of characteristics which it owes to the fact that it is a social instrument and not to the fact that it is a surveying instrument. The first of these is that a school survey must always be coöperative. It cannot be successfully imposed from without. If the teachers and officers of a school system do not want a survey, they will not have one; at least they will not have a real one. They may have an investigation, an inquiry, and examination, and a report, but they will not have a real school survey.

The outsider who is so unwise as to go into a school system where he is not wanted, to conduct a study in which the superintendent and teachers do not have confidence, may gather many objective facts. But he will find it quite impossible to go deeper down under the surface to reach those subtler truths which concern the whole community and which constitute the materials for straight thinking about the situation.

That is why no man should ever be invited to conduct a school survey unless the superintendent and the teaching force have full confidence in his ability to do the work and genuinely intend to coöperate with him in doing it.

The second social essential of the school survey is its public character. A survey report can never be a confidential report. It is often possible to work out far-reaching reforms in a school system by getting a group of strong men and women together around a table and convincing them that a certain course is the right one to take. This is a legitimate and often a valuable method of reform but it is not the method of the survey.

The school survey is a new and distinctive implement of progress. It has come into being for the purpose of educating the public about their schools, and its distinctive function should be preserved. It is a part of our national self-examination. It is the product of civic intelligence and community progress.

Its object is to make the entire school system pass in review before the public eye. It makes the schools and the public pay attention to each other. It presents the past, the present, and the possible. It is a community stock-taking, inventory, and appraisal of its educational assets and opportunities. It aims to place before the citizens a picture of their schools; a picture so accurate that it cannot mislead; so simple that it cannot be misunderstood, and so significant that it cannot be disregarded. It does not always succeed in its aim, but it cannot even take aim in secret or in the dark.

School surveys are never desired in cities where interest in education is dormant or in States where schools are at a standstill. Where conditions are at their best and social progress most active, the movement for self-examination is most virile. Where social conditions are darkest, it is weakest. Moreover, in a larger sense the schools themselves are responsible for the situation in which they now find themselves. During the past third of a century our expenditures for public education have grown with a rapidity scarcely paralleled in the history of the world. These expenditures pay only one sort of dividend, namely, minds that are trained to think straighter, more sequentially, more logically, more incisively. Everywhere we have been turning out more and more such minds and now they are grappling with our problems and crowding them for solution. The school survey is the product of the public resolve to know, and it can only succeed in the light and in the open.

There is but slight tendency toward uniformity in the matter of the organizations which have conducted the thirty more important surveys that have been completed. These pieces of work have been carried thru by organizations or individuals as follows:

Individuals	7
Universities	6
Bureaus of Municipal Research	5
State Departments of Education	3
Foundations	3
U. S. Bureau of Education	2
Municipal Departments	2
National Societies	2

The most significant fact with regard to the men chosen to direct these surveys is that in most cases they have been either professors of education or special investigators and in only one case has such a piece of work been carried thru by a city superintendent of schools. The directors of these thirty surveys have been the following:

Professors of Education	13
Special Investigators	11
Directors of Foundations	4
U. S. Commissioner of Education	1
Superintendent of Schools	1

In the matter of cost the variations are even more striking than in the matter of organization. The expense involved in the different surveys has ranged all the way from $126.89 for the Waterbury, Conn., survey to a total said to aggregate nearly $125,000 for the New York inquiry. The cost figures that are available for the different pieces of survey work are as follows:

Montclair, New Jersey	$500 00
Baltimore, Maryland	2,000 00
East Orange, New Jersey	1,000 00
Bridgeport, Connecticut	1,000 00
Waterbury, Connecticut	126 89
Portland, Oregon	7,500 00
New York, New York	125,000 00
State of Ohio	10,000 00
State of Vermont	10,000 00
Springfield, Illinois	3,261 00
San Francisco, California	700 00
Butte, Montana	4,500 00

In the matter of time expended in carrying thru the different pieces of work the range is again surprisingly great. Some of the figures are as follows:

Baltimore	3 months
East Orange	2½ months
Vermont High Schools	4 months
Montgomery County	4 months
Waterbury	3 days
New York	2 years, 2 months
Portland	4 months
Ohio	8 months
Springfield	2½ months
San Francisco	3 months
Butte	1 month

Some of the surveys have been conducted by individuals with practically no outside assistance while others have demanded the services of considerable scores of highly trained experts. The available data show the following conditions:

9 surveys conducted by 1 individual.
8 surveys conducted by 2 individuals.
4 surveys conducted by 3 individuals.
2 surveys conducted by 4 individuals.
2 surveys conducted by 5 individuals.
1 survey conducted by 7 individuals.
3 surveys conducted by 8 individuals.
1 survey conducted by 12 individuals.

In the bulk of the published reports we again find extreme variation. Some of the figures showing the size of these publications in pages are as follows:

The smallest consists of six pages and the largest of 2,573.
11 less than 100 pages.
3 from 100 to 200 pages.
2 from 200 to 300 pages.
2 from 300 to 400 pages.

There are three principal modes of presentation of survey reports. In some cases the entire report is written by the director. In the instances under consideration this is the mode of presentation in seven cases. In five more the report is made up of separate chapters or sections written by experts employed to conduct specific sections of the study. This may be termed the monographic method of presentation. In fifteen cases the report is neither by the director nor monographic but is made by the investigators as a group.

This may be termed the collective method of reporting. In the remaining three cases the director and monographic methods are found in the same report.

Even in the matter of nomenclature there is as yet no uniformity in school reporting. In these thirty cases thirteen of the reports are called surveys; seven of them studies; five of them reports; two of them examinations; one an investigation; one an inquiry, and one an expert survey.

To summarize the salient characteristics of the survey it may be said that they are thirty in number; that they have all been conducted in the past four years; that they are increasing in frequency; that they have largely been conducted by professors of education; that they have largely been undertaken by agencies or individuals outside of the school systems; that they range in cost from $126 to nearly $126,000; that the time consumed ranges from three days to more than two years; and that the reports range in bulk from six pages to nearly 2,600 pages.

It is impossible to classify the surveys accurately as to their inception. Nevertheless such a classification may be made tentatively with the expressed qualification that its accuracy cannot be demonstrated. Three of the men who have been intimately connected with most of the survey work that has been undertaken recently attempted to classify the thirty surveys as to their inception and reached the following conclusions: They decided that twelve of them had their inception in a general movement for educational betterment; that seven of them were the outcome of rows; that four were started thru influences outside of the localities; that two were inspired thru politics; two by a movement for social reform, and one each by movements for municipal efficiency, the forwarding of home missions, and a city boosting campaign.

It is even more difficult to agree as to results than it is to be accurate as to inceptions. The same three men referred to in the preceding paragraph agreed that the results of these thirty surveys might be classified as bad in five cases, none in five cases, moderately good in eleven cases, and very good in nine cases.

What the future of the school survey may be, no man knows, but two indications are significant. The first is the probability that we shall have a great many of them in the near future. In the past four years two States, ten counties, and eighteen cities conducted them. At the present time there are under way or definitely projected more school surveys than all those combined that have so far been completed. That the movement is rapidly spreading is certain.

The other significant indication is that they are steadily improving in quality. It is almost literally true that every survey report that has been published has in one or more conspicuous respects been superior to all its predecessors. This results from the fact that we began to make surveys without knowing how and we have been learning as we went along. It is well for us to remember that while we are making these inventories the methods of making them are themselves in the making.

What the ultimate results of the surveys will be, we do not know, for sufficient time has not as yet elapsed for us to judge. We have at hand, however, dependable figures showing the results of one piece of educational measuring which has become a part of the survey movement altho it was not started by it.

Just ten years ago the distinguished superintendent of schools of New York called attention to the fact that thirty-nine percent of the children in the schools of that city were above the normal ages for their grades. This aroused wide-spread investigation which showed that similar conditions obtained in other cities thruout the country. Soon studies of this phase of educational efficiency showed that the same conditions which resulted in our schools being crowded with retarded children also prevented a large proportion of these children from ever completing the elementary grades.

About seven years ago this became one of the most widely studied problems of educational administration, and in the past four it has been one of the prominent parts of the school surveys. During the entire period hundreds of superintendents thruout the country have been readjusting their schools to better the conditions disclosed.

In these seven years the number of children graduating each year from the elementary schools of America has doubled. The number now is three-quarters of a million greater annually than it was then. The only great organized industry in America that has increased the output of its finished product as rapidly as the public schools during the past seven years is the automobile industry.

It is probable that no other one thing so fundamentally important to the future of America as this accomplishment of our public schools has taken place in recent years. There is every evidence that this is the direct result of applying measurements to education. If the school survey movement now under way can produce other results at all comparable with this one, we need have no fear for the outcome.

The educational vernacular abounds in terms to which usage has given meaning quite different from those they originally had. Witness the anomaly presented by "school", which meant "leisure", and "pedagog", which meant "slave". It is greatly to be hoped that the word "survey" will not join this company of verbal turncoats but instead will retain its meaning unchanged as the years go by. It has always meant a looking-over, and it is to be hoped that in its new educational application it will continue to mean the kind of looking-over of everything that does not overlook anything. Its future is secure if it can permanently stand for an impartial study of the schools of a community, competently conducted for the enlightenment of the public and the welfare of the children.

After some miscellaneous discussion Superintendent Brown called upon President Bryan who spoke as follows:

PRESIDENT BRYAN'S ADDRESS

PRESIDENT BRYAN: Mr. Chairman, ladies, and gentlemen, I wish to express my hearty appreciation of the kind words respecting the University that have come from the members of this conference. I may say that it is not my purpose at this time to make an address. I wish in a very few minutes to give an expression to the spirit of the University in this and similar types of work.

We had here a week ago Mr. Robins, of Chicago, who said among other things that there are two great conflicting ideas in society. One of them is the idea of Cæsar and the other is the idea of Christ: the idea of domination and the idea of service. I believe that I express the spirit of the men here when I say that it is our wish to be moved by this second ideal and not by the first. It is not in our hearts to dominate anything or anybody, but we do wish to serve everybody; and we wish to coöperate with everybody along the lines of University work. We wish to cöoperate with the other colleges of the State, and when I say that I mean that we are actually trying to do so. We profoundly appreciate the genuinely kindly sentiments which have been expressed towards us by these sister institutions, and we count ourselves deeply bound to reciprocate that, not simply in words but in deeds.

So, for example, in our extension service we have sought and have to a considerable extent secured the coöperation of the colleges, or some of them. Members of the faculties of those institutions have joined in the extension work. We have a feeling of very hearty coöperation with our sister State institutions, the State Normal School and Purdue University. We are not in the least jealous of anything which they are doing, either within their walls or thruout the State.

For illustration, during the past year there have been three women, one representing Purdue University, one representing the State Normal School, and one representing Indiana University, who have traveled over the State from county to county giving assistance in the field of domestic economy. There has been more work to do than all of them together could do. There is no competition or rivalry here, but there is coöperation in accordance with a well-laid plan.

And so it is in every field. All of our workers in the extension service understand that everywhere we are to do all we can to help make the extension work of other institutions succeed. There is, as I said a moment ago, in all these fields far more than all of us together can do. We believe that the most important single thing that we can do as a university is to be done within the walls of the university itself. I do not believe that the time will ever come when this will not be the case. The great functions of the University are search for the truth and the training of men and women. On the other hand, along with other institutions within and without the State, we are trying to find out a few genuine ways of carrying the things which the University has to all parts of the State; and those of our staff who have this immediately in hand are wary of undertaking things which are not genuinely worth while, and are earnestly seeking to select those things which will really justify themselves.

Doubtless some errors will be made in this or that direction, but the spirit of this effort is the fundamental spirit of the University as a world institution. That is to see and do that which is first rate. The University stands for first-rateness as distinguished from second- or third-rateness.

A few years ago William James made one of his great addresses before the Association of Collegiate Alumnae of the United States. His opening sentence was this: "The end of an education is to enable you to know a good man when you see him." There was a touch of humor in his saying this to a company of women but he said seriously that this is a sufficient definition of education.

The object of education may be expressed in that way. It is to bring you to the point where you can see the difference between what is first rate and what is not first rate in every field. If it is in the field of music it is to bring you to a point where you know at once whether that which you are hearing is classical and good, or whether it is pretentious and inferior. It is to bring you, if you are a student of literature, to the point where if you should happen to find a page of some unknown work you would have a judgment as soon as you read it whether it was literature or not. And so in every field the end of education is to bring one to the point where he can bring the highest judgment of the world to bear upon the thing which is before him.

That is what the University as a world institution stands for. That, according to the measure of our ability, is what we stand for. And that is the object of all the extension work of every sort that we shall undertake.

Mr. Brooks, the professor of art, is sending about over the State little boxes of pictures. Some of you have had them in your schools, no doubt. They do not make a great show. The boxes are rather small. The pictures are small; but there is no picture in any of those boxes that is not judged to be either itself a masterpiece, or a photograph of a masterpiece. Something like two-thirds of these pictures are original etchings and drawings by masters; and many of the children will for the first time in their lives see the work of a master at first hand.

These pictures, as I say, are small, but they are good. They are first rate; and the object of this exhibit is to help young people to the point where they can know a good thing when they see it.

So in every field. So in the field in which you are interested in this conference. Our object has been, last year and this year, to bring here the best men in the country, so that we may have the advantage of their ideas and their instruction and their inspiration.

One might say that the end of organized society is to bring the best that is anywhere to each point. The function of the University is to do that.

In the old days there was a feeling on the part of some persons that Indiana was a country far removed from the centers of civilization. The name Hoosier was a reproach. I remember myself twenty-five years ago going up and down the State saying with all my might that this is the holy land. I believed that then and I believe it now. I believe there is no place where the sun shines brighter than it does here. I believe in the phrase that I remember from an old lecture, the first I ever gave, that the Wabash is as good a river and draws after it a retinue of brooks as beautiful as the Jordan or the Rhine. I believe that we, standing here upon this maligned ground of Hoosierdom, can receive the largest and best light that there is in the world, and make this in its turn a center of universal enlightenment.

APPENDIX

⁂During the conference on Educational Measurements the auditorium in which the meetings were held was provided with booths, in which were hung a large number of tables and charts dealing with problems considered in the conference. The following exhibits from among this material are selected for reproduction here.

A. BLOOMINGTON PUBLIC SCHOOLS

(Data furnished by Superintendent H. L. Smith)

EXHIBIT I.—SHOWING PERCENTAGE OF PROMOTIONS IN THE GRADE SCHOOLS AT THE CLOSE OF THE FIRST SEMESTER, 1914–15. (ALL CHILDREN IN THE SYSTEM INCLUDED)

In the following Tables promotions are worked out on four bases:

Basis No. 1. Percentage that number of promotions plus number of conditions is of number of pupils remaining until close of the semester.

Basis No. 2. Percentage that number of promotions plus number of conditions is of the number of pupils remaining to end of semester plus the number that withdrew during the semester to quit school.

Basis No. 3. Percentage the number of promotions is of the number of pupils remaining until close of the semester.

Basis No. 4. Percentage the number of promotions is of the number of pupils remaining to end of semester plus those who withdrew to quit school.

GRADE.	Promotions on Basis No. 1.	Promotions on Basis No. 2.	Promotions on Basis No. 3.	Promotions on Basis No. 4.
1B	82.5	80.2	79.0	76.7
1A	90.4	90.4	89.4	89.4
2B	95.3	95.3	93.6	93.6
2A	97.1	97.1	94.3	94.3
3B	89.6	89.6	84.3	84.3
3A	96.7	96.7	93.7	93.7
4B	88.9	88.9	76.8	76.8
4A	88.0	88.0	86.0	86.0
5B	93.8	91.9	86.2	85.7
5A	91.7	89.0	89.7	89.0
6B	88.3	85.0	68.9	66.3
6A	88.8	84.5	53.8	51.2
7B	90.4	85.2	53.0	50.0
7A	88.9	82.1	58.3	53.8
8B	84.3	80.5	65.1	62.1
8A	97.8	95.7	97.8	95.7
9B	88.2	76.7	87.0	75.6
9A	88.0	76.1	80.1	69.7
10B	96.1	87.0	89.8	81.2
10A	86.8	80.7	78.7	73.1
11B	94.2	90.6	86.4	83.1
11A	92.7	87.7	88.6	83.8
12B	98.0	92.3	95.4	90.0
12A	95.5	91.3	93.2	89.1

EXHIBIT II.—SHOWING PERCENTAGE OF PROMOTIONS BY SUBJECTS IN THE BLOOMINGTON HIGH SCHOOL, AT THE CLOSE OF THE FIRST SEMESTER, 1914-15

In the following Tables promotions are worked out on four bases:

Basis No. 1. Percentage that number of promotions plus number of conditions is of number of pupils remaining until close of the semester.

Basis No. 2. Percentage that number of promotions plus number of conditions is of the number of pupils remaining to end of semester plus the number that withdrew during the semester to quit school.

Basis No. 3. Percentage the number of promotions is of the number of pupils remaining until close of the semester.

Basis No. 4. Percentage the number of promotions is of the number of pupils remaining to end of semester plus those who withdrew to quit school.

GRADE.	Promotions on Basis No. 1.	Promotions on Basis No. 2.	Promotions on Basis No. 3.	Promotions on Basis No. 4.
English	90.7	82.2	84.3	76.4
Latin	91.5	87.8	88.0	84.5
German	86.7	79.6	84.7	77.8
Mathematics	87.5	79.6	80.6	73.3
History	92.2	85.2	86.3	79.7
Commercial	92.5	80.4	88.7	77.1
Physical Geography	94.1	84.2	94.1	84.2
Physics	100.0	95.5	98.4	94.0
Botany	86.4	76.0	77.3	68.0

EXHIBIT III.—SHOWING BY PERCENTS THE DISTRIBUTION OF SCHOLARSHIP MARKS GIVEN IN VARIOUS SUBJECTS AND GRADES, FIRST SEMESTER, 1914–15

Part 1.—Distribution by Subjects and Grades

SUBJECT AND GRADE.	Superior, 96-100.	Excellent, 91-95.	Good, 86-90.	Fair, 81-85.	Passing, 75-80.	Not Passing, Below 75.
READING:						
1B	10.8	16.7	24.3	24.3	11.7	12.2
1A	2.2	21.7	26.1	32.7	9.8	7.6
2B	5.7	23.6	35.7	22.8	7.9	4.3
2A	11.4	27.6	36.2	15.2	6.7	2.9
3B	3.9	24.5	31.6	16.8	19.4	3.9
3A	8.0	31.0	34.0	19.0	7.0	1.0
4B	10.9	21.2	29.9	24.1	10.9	2.9
4A	4.0	18.2	32.3	21.2	20.2	4.0
5B	2.4	22.4	33.6	28.8	12.0	0.8
5A	10.3	15.5	42.3	21.6	10.3	0.0
6B	0.9	15.3	29.7	27.0	24.3	2.7
6A	1.3	11.3	15.0	30.0	30.0	12.5
7B	3.5	17.6	18.8	16.5	34.1	9.4
7A	1.4	10.9	19.2	16.4	39.7	12.3
8B	0.0	12.5	25.0	29.2	18.1	15.3
8A	0.0	6.7	20.0	21.7	43.3	8.3
GEOGRAPHY:						
4B	2.5	13.8	46.3	31.3	6.3	0.0
4A	15.2	20.2	34.3	12.1	9.1	9.1
5B	3.2	11.1	32.5	23.8	23.8	5.6
5A	4.2	9.5	41.1	32.6	10.5	2.1
6B	0.0	9.0	24.3	20.7	34.2	11.7
6A	0.0	8.8	12.5	20.0	46.2	12.5
7B	0.0	5.9	18.8	22.4	44.7	8.3
7A	0.0	9.7	23.6	25.0	34.7	6.9
ARITHMETIC:						
3B	3.8	17.9	29.5	19.2	17.9	11.5
3A	9.2	22.0	29.4	22.9	12.8	3.7
4B	0.0	12.5	19.9	27.2	26.5	14.0
4A	10.1	18.1	31.3	13.1	18.1	9.1
5B	2.5	12.3	26.2	22.1	32.0	4.9
5A	4.1	11.3	32.0	22.7	19.6	10.3
6B	0.9	15.3	28.8	26.1	20.7	8.1
6A	0.0	7.5	22.5	28.8	26.2	15.0
7B	3.5	14.1	20.0	15.3	25.9	21.2
7A	1.4	17.0	22.2	25.0	34.7	9.7
8B	0.0	10.8	21.5	26.2	30.8	10.8
8A	0.0	4.9	6.6	31.1	50.8	6.6

EXHIBIT III—Continued

SUBJECT AND GRADE.	Superior, 96-100.	Excellent, 91-95.	Good, 86-90.	Fair, 81-85.	Passing, 75-80.	Not Passing, Below 75.
LANGUAGE AND GRAMMAR:						
4B	4.0	14.2	37.0	21.3	17.3	6.3
4A	5.1	21.5	36.7	17.3	15.3	4.0
5B	3.2	16.1	30.0	36.3	13.7	0.8
5A	3.1	14.4	35.1	30.9	12.4	4.1
6B	0.9	5.4	15.3	30.6	27.9	19.8
6A	2.5	6.3	15.0	18.8	40.0	17.5
7B	1.7	5.1	33.9	30.5	0.0	28.8
7A	5.6	13.9	11.1	22.2	18.1	29.2
8B	0.0	5.6	15.5	12.7	36.6	29.7
8A	0.0	3.3	23.3	23.3	30.0	20.0
HISTORY:						
4B	2.5	9.0	36.0	38.5	13.9	0.0
4A	8.1	21.6	41.9	10.8	13.5	4.1
5B	3.1	11.8	32.3	41.7	10.2	0.8
5A	4.1	18.6	42.3	20.6	10.3	4.1
6B	10.0	8.2	22.5	15.3	28.8	15.3
6A	5.0	8.8	15.0	22.5	27.5	21.2
7B	0.0	0.0	7.7	33.0	51.6	7.7
7A	0.0	4.2	15.3	15.3	52.8	12.5
8B	0.0	0.0	18.3	26.8	35.2	19.7
8A	0.0	0.0	15.0	35.0	41.7	8.3
SPELLING:						
3B	8.4	33.7	32.5	9.0	7.2	9.0
3A	18.0	37.8	24.3	14.4	2.7	2.7
4B	11.7	32.1	26.3	19.7	7.3	2.9
4A	11.1	32.3	37.4	8.1	8.1	3.0
5B	7.9	29.8	35.1	21.1	4.4	1.8
5A	13.4	22.7	29.9	21.6	10.3	2.1
6B	39.0	32.7	15.9	6.2	6.2	0.0
6A	43.8	23.8	18.8	7.5	2.5	3.8
7B	58.8	21.2	9.4	2.4	7.1	1.2
7A	44.4	27.8	16.7	7.0	2.8	1.4
8B	49.3	26.0	11.0	6.8	4.1	2.7
8A	72.1	23.1	3.3	3.3	0.0	0.0

EXHIBIT III—Continued

SUBJECT AND GRADE.	Superior, 96-100.	Excellent, 91-95.	Good, 86-90.	Fair, 81-85.	Passing, 75-80.	Not Passing, Below 75.
LATIN (HIGH SCHOOL):						
9B	25.8	22.6	16.1	25.8	6.4	3.2
9A	0.0	15.4	23.1	30.8	15.4	15.4
10B	12.9	19.4	29.0	12.9	6.5	19.4
10A	10.0	15.0	15.0	25.0	5.0	30.0
11B	6.3	12.5	37.5	18.8	18.8	6.3
11A	7.7	38.5	30.8	15.4	7.7	0.0
12B	10.0	50.0	30.0	10.0	0.0	0.0
12A	28.6	42.9	14.3	14.3	0.0	0.0
GERMAN (HIGH SCHOOL):						
9B	0.0	32.0	14.0	18.0	22.0	14.0
9A	0.0	6.3	18.7	25.0	18.7	31.3
10B	0.0	9.0	24.4	17.8	31.1	17.8
10A	3.3	6.7	16.7	20.0	26.7	26.7
11B	6.8	17.2	24.1	38.0	10.3	3.4
11A	0.0	18.2	36.4	18.2	18.2	9.0
12B	0.0	30.8	38.5	7.7	23.1	0.0
12A	0.0	16.7	16.7	16.7	33.3	16.7
ENGLISH (HIGH SCHOOL):						
9B	0.0	13.6	25.8	31.8	18.2	10.6
9A	2.9	17.1	20.0	34.3	8.6	17.1
10B	1.9	11.3	35.8	13.2	20.8	17.0
10A	0.0	5.1	7.7	25.6	41.0	20.5
11B	0.0	10.9	13.0	26.1	45.7	4.3
11A	0.0	4.5	0.0	22.7	45.5	27.2
12B	0.0	11.3	30.2	22.7	30.2	5.7
12A	0.0	9.0	45.5	27.3	18.2	0.0
HISTORY (HIGH SCHOOL):						
10B	0.0	20.4	22.4	28.6	16.3	12.2
10A	....	....	....	....	....	....
11B	4.1	12.2	28.5	20.4	24.5	10.2
11A	0.0	13.3	26.7	33.3	26.7	0.0
12B	7.0	9.3	53.5	16.3	9.3	4.7
12A	5.9	23.5	29.4	29.4	5.9	5.9

EXHIBIT III—Continued

SUBJECT AND GRADE.	Superior, 96-100.	Excellent, 91-95.	Good, 86-90.	Fair, 81-85.	Passing, 75-80.	Not Passing, Below 75.
MATHEMATICS (HIGH SCHOOL):						
9B	9.4	20.3	29.7	14.1	10.9	15.6
9A	8.0	28.0	28.0	12.0	4.0	20.0
10B	0.0	15.3	22.0	23.7	25.4	13.6
10A	5.0	10.0	17.5	20.0	25.0	22.5
11B	0.0	8.7	21.7	23.9	32.6	13.0
11A	11.1	7.4	11.1	33.3	29.7	7.4
COMMERCIAL (HIGH SCHOOL):						
9B	0.0	29.4	17.6	29.4	11.8	11.8
9A	0.0	7.7	15.4	23.1	53.8	0.0
10B	4.3	39.1	13.0	21.7	4.3	17.4
10A	0.0	20.0	0.0	50.0	30.0	0.0
11B	0.0	16.1	29.0	29.0	19.4	6.5
11A	0.0	9.0	9.0	27.3	36.4	18.2
12B	5.9	11.8	17.7	29.4	35.3	0.0
12A	0.0	16.7	66.7	16.7	0.0	0.0
PHYSICAL GEOGRAPHY (HIGH SCHOOL):						
9A	17.7	23.5	47.1	5.9	0.0	5.9
PHYSICS (HIGH SCHOOL):						
12B	9.1	30.9	40.0	16.4	3.6	0.0
12A	0.0	0.0	100.0	0.0	0.0	0.0
BOTANY (HIGH SCHOOL):						
9B and 9A	0.0	9.5	19.0	33.3	19.0	19.0

EXHIBIT III—Continued

Part 2.—Distribution by Grades and by Subjects Combined

This table gives the percentage of "Superior", "Excellent", "Good", etc., awarded in all subjects included in Part 1.

GRADE.	Superior, 96–100.	Excellent, 91–95.	Good, 86–90.	Fair, 81–85.	Passing, 75–80.	Not Passing, Below 75.
ELEMENTARY SCHOOLS BY GRADES:						
1B	10.8	16.7	24.3	24.3	11.7	12.1
1A	2.2	21.7	26.1	32.6	9.8	7.6
2B	5.7	23.8	35.7	22.9	7.9	4.2
2A	11.4	27.6	36.2	15.2	6.7	2.8
3B	5.5	25.6	31.2	14.9	14.7	8.2
3A	11.9	30.3	29.1	18.7	7.5	2.5
4B	5.5	17.6	31.4	26.5	14.2	4.8
4A	8.6	21.5	35.4	14.6	14.6	5.4
5B	3.5	17.8	31.1	29.1	16.1	2.4
5A	6.4	15.1	36.4	24.6	12.0	5.4
DEPARTMENT SCHOOL BY GRADES:						
6B	8.4	14.4	22.8	21.0	23.7	9.6
6A	8.8	11.0	16.5	21.3	28.7	13.7
7B	11.6	10.8	16.5	19.8	28.9	12.2
7A	8.8	12.2	18.1	18.5	30.5	12.0
8B	10.2	10.0	15.8	21.2	28.0	14.7
8A	14.6	7.3	13.6	22.8	33.1	8.6
HIGH SCHOOL BY GRADES:						
9B	5.7	22.0	22.9	23.3	13.9	12.2
9A	5.1	15.3	23.7	22.9	16.1	17.0
10B	2.3	16.7	25.8	20.2	19.4	15.6
10A	3.5	9.2	12.8	24.8	27.7	22.0
11B	2.3	12.4	24.0	25.8	27.6	7.8
11A	3.9	11.8	15.7	25.5	32.3	10.8
12B	5.2	20.3	37.5	18.2	16.1	2.6
12A	5.8	19.2	40.4	21.2	9.6	3.8

EXHIBIT III—Continued

Part 3.—Subject Averages, All Grades

SUBJECT.	Superior, 96–100.	Excellent, 91–95.	Good, 85–90.	Fair, 81–85.	Passing, 75–80.	Not Passing, Below 75.
DEPARTMENT SCHOOL:						
Reading	1.3	13.4	21.8	21.6	32.0	9.9
Geography	0.0	8.7	17.6	22.3	41.1	10.4
Arithmetic	1.1	10.7	20.1	25.5	30.3	12.3
History	3.2	4.1	14.1	23.3	40.5	14.8
Grammar	1.8	6.9	18.2	21.4	27.1	24.6
German	0.0	0.0	28.6	28.6	21.4	21.4
Latin	0.0	8.3	33.3	25.0	33.3	0.0
Spelling	51.7	24.0	13.1	5.4	4.3	1.5
HIGH SCHOOL:						
English	.6	11.1	22.5	25.2	28.0	12.6
Mathematics	4.9	14.7	22.3	20.4	22.6	15.0
Physical Geography	16.7	22.2	44.4	5.6	0.0	11.1
History	3.4	15.4	32.6	24.6	16.0	8.0
Latin	13.5	23.4	24.1	20.0	7.8	11.3
German	1.5	17.5	21.5	21.0	23.0	15.5
Commercial	1.6	20.3	19.5	28.1	22.7	7.8
Physics	8.3	28.3	45.0	15.0	3.3	0.0
Botany	0.0	10.5	21.1	36.8	21.1	10.5
DEPARTMENT SCHOOL AS A WHOLE	10.1	11.4	17.9	20.7	28.2	11.7
HIGH SCHOOL AS A WHOLE	4.0	16.3	24.6	22.4	20.8	11.8

EXHIBIT IV.—ACHIEVEMENT OF BLOOMINGTON HIGH SCHOOL GRADUATES AS STUDENTS IN INDIANA UNIVERSITY

Showing for all undergraduates in Indiana University and for all undergraduates of Indiana University who were alumni of the Bloomington high school, the number and percent of hours of work of the various qualities—A (100–95), B (94–85), C (84–75), D (74–65), E (Conditioned, Failed, and Incomplete)—for the school year 1910-11.

	WORK MARKED A.		WORK MARKED B.		WORK MARKED C.	
	Total Number of Hours.	Percent of Total Number of Hours of Work Taken.	Total Number of Hours.	Percent of Total Number of Hours of Work Taken.	Total Number of Hours.	Percent of Total Number of Hours of Work Taken.
Total Indiana University undergraduates for year 1910-11......	....	21.7	....	35.8	....	24.3
Indiana University undergraduates who were alumni of Bloomington high school...	619	23.0	995	37.0	701	26.0

	WORK MARKED D.		WORK CONDITIONED, FAILED, OR INCOMPLETE.	
	Total Number of Hours.	Percent of Total Number of Hours of Work Taken.	Total Number of Hours.	Percent of Total Number of Hours of Work Taken.
Total Indiana University undergraduates for year 1910-11	....	9.8	....	8.3
Indiana University undergraduates who were alumni of Bloomington high school ...	252	9.4	124	4.6

The following table indicates the showing made by Bloomington high school graduates in the award of honors at Indiana University:

SCHOOL YEAR ENDING	TOTAL GRADUATES			GRADUATING WITH HIGH DISTINCTION		
	Total Indiana University graduates.	Total Indiana University graduates also Bloomington high school graduates	Percent of total number Bloomington high school graduates	Number Indiana University graduating with high distinction	Number Bloomington high school graduating with high distinction	Percent of high distinction Bloomington high school graduates supply
1909........	205	18	8.8	3	0	0
1910........	215	11	5.1	5	1	20
1911........	202	17	8.4	5	1	20
1912........	225	12	5.3	6	2	33.3
1913........	265	20	7.5	12	1	8.3
Total...	1112	78	7.1	31	5	16.1

SCHOOL YEAR ENDING	GRADUATING WITH DISTINCTION			BOTH HONORS		
	Number Indiana University graduating with distinction	Number Bloomington high school graduating with distinction	Percent of distinction Bloomington high school graduates supply	Number Indiana University graduates in both classes of distinction	Number Bloomington high school graduates in both classes of distinction	Percent of both classes of distinction supplied by Bloomington high school graduates
1909.........	9	1	11.1	12	1	8.3
1910.........	8	0	0.0	13	1	7.7
1911.........	17	4	23.5	22	5	22.7
1912.........	16	5	31.3	22	7	31.8
1913.........	18	4	22.2	30	5	16.7
Total...	68	14	20.6	99	19	19.2

EXHIBIT V.—SHOWING NUMBER AND PERCENT OF PUPILS ENTERING THE BLOOMINGTON HIGH SCHOOL WHO COMPLETED THEIR HIGH SCHOOL COURSE

CLASS ENTERING	Number in class	Number graduated from Bloomington high school	Number graduated from high school elsewhere	Percent of entering class that graduated
January, 1904	22	15	3	81.8
January, 1905	36	15	1	44.4
January, 1906	22	10	2	54.5
January, 1907	37	17	3	54.1
January, 1908	30	14	1	50.0
January, 1909	25	12	2	56.0
Total	172	83	12	55.8
September, 1905	96	47	2	51.0
September, 1906	63	33	2	55.6
September, 1907	73	43	2	61.6
September, 1908	55	10	5	27.3
September, 1909	105	49	1	47.6
Total	392	182	12	49.5
Grand total, January and September	564	265	24	51.2

EXHIBIT VI.—TABLE SHOWING WITHDRAWALS FROM HIGH SCHOOL BY SEX AND NUMBER OF CREDITS AT TIME OF WITHDRAWAL

The number of credits required to graduate is 32. The period covered began with the second semester, 1903-04, and closed with the second semester, 1914.

NUMBER OF CREDITS AT TIME OF WITHDRAWAL	Boys	Girls	Total	Percent of total withdrawals
0	1	4	5	1.0
1	14	4	18	3.6
2	10	12	22	4.5
3	19	12	31	6.3
4	27	28	55	11.1
5	12	13	25	5.1
6	9	16	25	5.1
7	14	16	30	6.1
8	17	29	46	9.3
9	6	14	20	4.0
10	5	11	16	3.2
11	7	9	16	3.2
12	8	12	20	4.0
13	5	8	13	2.6
14	9	10	19	3.8
15	6	10	16	3.2
16	10	11	21	4.2
17	9	4	13	2.6
18	1	8	9	1.8
19	5	6	11	2.2
20	1	6	7	1.4
21	4	3	7	1.4
22	7	6	13	2.6
23	0	2	2	.4
24	5	6	11	2.2
25	2	1	3	.6
26	1	2	3	.6
27	2	3	5	1.0
28	4	0	4	.8
29	0	2	2	.4
30	2	3	5	1.0
31	1	0	1	.2
Total	223	271	494	99.5

EXHIBIT VII.—WITHDRAWALS BY SEMESTERS. ALL WITHDRAWALS FOR ANY CAUSE WHATEVER

YEAR	Semester	Withdrawals in semester	Withdrawals in year
1903–1904	First	3	
	Second	9	12
1904–1905	First	10	
	Second	23	33
1905–1906	First	12	
	Second	37	49
1906–1907	First	10	
	Second	28	38
1907–1908	First	17	
	Second	17	34
1908–1909	First	18	
	Second	29	47
1909–1910	First	22	
	Second	34	56
1910–1911	First	18	
	Second	29	47
1911–1912	First	15	
	Second	42	57
1912–1913	First	23	
	Second	36	59
1913–1914	First	12	
	Second	39	51

EXHIBIT VIII.—NUMBER AND PERCENT OF EIGHTH GRADE GRADUATES FROM THE BLOOMINGTON COMMON SCHOOLS THAT ENTER THE BLOOMINGTON HIGH SCHOOL

DATE OF GRADUATION FROM GRADES	Number in class	Number entering high school	Percent entering high school
January, 1907	36	32	88.9
May, 1907	29	25	86.2
January, 1908	34	31	91.2
May, 1908	39	34	87.2
January, 1909	31	28	90.3
May, 1909	46	42	91.3
January, 1910	25	20	80.0
June, 1910	17	16	94.1
January, 1911	31	29	93.5
June, 1911	62	58	93.5
January, 1912	36	35	97.2
June, 1912	55	48	87.3
January, 1913	39	36	92.3
June, 1913	51	41	80.4
January, 1914	30	26	86.7
Total	561	501	89.3

EXHIBIT IX.—WITHDRAWALS FROM HIGH SCHOOL ACCORDING TO AGE SINCE THE YEAR 1904–05

In many cases age records were not available.

AGE AT TIME OF WITHDRAWAL	Boys	Girls	Total
14	3	6	9
15	18	15	33
16	25	28	53
17	44	48	92
18	25	27	52
19	16	27	43
20	11	13	24
21	1	1	2
22	4	1	5
23	1	1	2
24	1	0	1
Total	149	167	316

EXHIBIT X.—PRESENT OCCUPATION OF 409 GRADUATES OF BLOOMINGTON HIGH SCHOOL

Table worked out by Mr. Fred Lewis, formerly teacher of mathematics in Bloomington High School.

PRESENT OCCUPATION	Class 1903			Class 1904			Class 1905			Class 1906			Class 1907			Class 1908			Class 1909			Class 1910			Class 1911			Class 1912			Total		
	Boys	Girls	Both	Boys	Girls	Both	Boys	Girls	Both	Boys	Girls	Both	Boys	Girls	Both	Boys	Girls	Both	Boys	Girls	Both	Boys	Girls	Both	Boys	Girls	Both	Boys	Girls	Both	Boys	Girls	Both
Teacher	3	3	6	5	8	13	0	6	6	2	3	5	2	6	8	3	8	11	3	12	15	0	3	3	0	9	9	2	8	10	20	66	86
Student	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	4	9	3	12	8	10	18	13	10	23	7	10	17	39	35	74
Clerk	0	1	1	1	1	2	0	1	1	1	1	2	0	1	1	2	2	4	2	1	3	2	3	5	0	0	0	0	0	0	8	11	19
Bookkeeper	0	0	0	1	0	1	0	2	2	0	0	0	0	3	3	1	0	1	0	0	0	0	3	3	1	2	3	1	1	2	4	11	15
Stenographer, typewriter, and clerical work	0	0	0	0	1	1	0	0	0	0	2	2	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	1	1	2	1	5	6
Reporter, author, literary work, and miscellaneous	1	0	1	2	1	3	0	1	1	1	0	1	1	0	1	0	1	1	3	0	3	0	0	0	1	0	1	0	0	0	9	3	12
Music teacher and musician	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	1	0	1	1	0	1	0	1	1	0	0	0	0	1	1	2	3	5
No occupation or occupation unknown	0	1	1	3	0	3	2	0	2	3	0	3	4	0	4	3	4	7	5	3	8	3	3	6	2	2	4	2	0	2	27	13	40
Deceased	1	0	1	0	1	1	0	1	1	0	2	2	0	0	0	1	1	2	1	0	1	0	0	0	2	0	2	0	0	0	5	5	10
Farmer	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	1	1	0	1	1	0	1	1	0	1	1	0	1	6	0	6
Laborer	1	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	1	0	0	0	4	0	4
Traveling salesman	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	2	0	2	0	0	0	0	0	0	0	0	0	5	0	5
Physician, lawyer	1	0	1	1	0	1	1	0	1	1	0	1	1	0	1	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	6	0	6
Merchant, business	1	0	1	1	0	1	0	0	0	1	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	4
Engineers, etc	0	0	0	1	0	1	1	0	1	1	0	1	0	0	0	0	0	0	2	0	2	0	0	0	0	0	0	0	0	0	5	0	5
Housewife	0	14	14	0	9	9	0	13	13	0	11	11	0	7	7	0	9	9	0	10	10	0	5	5	0	3	3	0	0	0	0	81	81
Girls at home	0	5	5	0	5	5	0	3	3	0	4	4	0	8	8	0	0	0	0	4	4	0	1	1	0	0	0	0	1	1	0	31	31
Total	10	24	34	16	27	43	4	27	31	10	23	33	10	25	35	15	28	43	30	33	63	15	29	44	21	26	47	14	22	36	145	264	409

B. KENDALLVILLE PUBLIC SCHOOLS

(Data furnished by Superintendent P. C. Emmons)

EXHIBIT I.—EXPERIMENT IN THE USE OF THE HILLEGAS SCALE FOR ENGLISH COMPOSITION IN GRADE 8B

The subject assigned was: "How I would spend one hundred dollars to please five persons who like different things." Thirty-nine themes were graded by three judges, independently of each other. The grading was done rapidly. All three judges agreed exactly in two cases. Two judges agreed exactly in twenty-one other cases. Two judges agreed within fifty points of each other in all but eight cases.

	Judges			Value Selected
	E	B	S	
Leola DeVoe	675	474	585	585
Jesse Shipe	675	725	675	675
Milo Miller	472	369	369	369
Rilla Throp	725	585	700	700
Edward Geauque	700	625	772	700
Vogal King	675	675	772	675
Ruth Barnett	585	650	500	585
Helen Ortstadt	474	675	772	675
Howard Riddle	400	260	369	369
Clarence Milleman	369	369	450	369
Ralph Atz	369	369	750	369
Gladys Schnapp	325	474	400	400
Merlyn Staples	500	675	700	675
Harold Sebert	400	369	400	400
Mildred Carrick	675	625	675	675
Sheldon Eminger	260	369	369	369
Victor Burger	675	474	450	474
Florence Reichard	585	474	600	585
Lillian Gindlesparger	400	474	400	400
Trevor Shore	260	260	400	260
Lestie Martin	585	585	772	585
Marjorie Hess	260	369	585	369
Anna Miller	675	575	772	585
Helen Childs	369	369	369	369
Robert France	400	400	474	400
Geneva Davidson	675	474	550	550
Catherine Canode	700	675	772	700
Nellie Davis	585	585	750	585
Ruth Herb	369	369	585	369

EXHIBIT I.—Continued

	Judges			Value Selected
	E	B	S	
Lucile Johnson	369	474	400	400
Ruah Henry	474	474	585	472
Leland Miller	474	369	474	474
Glen Henry	369	369	450	369
Verus Smith	350	369	585	369
Helen Grams	675	675	675	675
Clinton Cunningham	700	474	474	474
Merle Morr	260	260	369	260
Paul Bruck	260	260	400	260
Bessie Oviatt	474	474	772	272
Lower Quartile	369	369	400	369
Median	474	474	585	474
Upper Quartile	675	610	675	675

EXHIBIT II.—EXPERIMENT IN THE USE OF THE HILLEGAS SCALE FOR ENGLISH COMPOSITION IN GRADE 8A

The subject assigned in this test was the same as in Exhibit I, and the grading was on the same basis. Wherever the values assigned by one judge differed greatly from those of the other two, a second reading was asked for, after an interval long enough to insure an independent second grading.

	Judges			Value Selected
	E	B	S	
Howard Foehl	675	600	772	675
Duane Jackson	474	369	369	369
Paul Bell	550	369	474	474
Walter Reed	474	369	550	474
Geo. Koons	675	585	675	675
Olive Rex	725	675	675	675
Ray Swogger	665	606	675	665
Benj. Moses	665	675	675	675
Robt. Shade	500	500	474	500

EXHIBIT II.—Continued

	Judges			Value Selected
	E	B	S	
Violet Crofoot	585	585	675	585
Vera Hendricks	675	650	675	675
Una Persing	585	625	665	625
Clara Milleman	675	675	675	675
Lloyd Uhl	585	550	575	575
Harrison Miller	675	665	665	665
Clarence Woolf	665	665	665	665
Sidney Munton	725	772	700	725
Iona Hosler	665	650	675	665
Sylvester Adams	665	772	772	772
Dolores Ryan	550	665	575	575
Miriam Diggins	750	772	772	772
Dallas Broughton	650	675	675	675
Walter Kaiser	500	550	575	550
Vogal Miller	650	600	675	650
Bernadine Kling	625	600	675	625
Ruth McFarland	500	550	550	550
Orville Diggins	550	550	550	550
Agnes Sobraski	600	675	665	665
Georgia Rowland	550	575	600	575
Harry Franke	550	665	665	665
Marie Dickinson	425	450	400	425
Totals	18,803	17,678	18,458	19,086

Total of all judges' marks	54,939
Total number of judgments	93
Average grade for class	590
Total values selected	19,086
Average of selected value for class	615
Median of total number of judgments	665
Lower Quartile	550
Upper Quartile	675

Exhibit III.—Seven Compositions Written by Pupils in Horace Mann School (Teachers' College), and Graded on the Hillegas Scale by a Class of Teachers, in the Summer Session, and Again by Thirty Kendallville Teachers

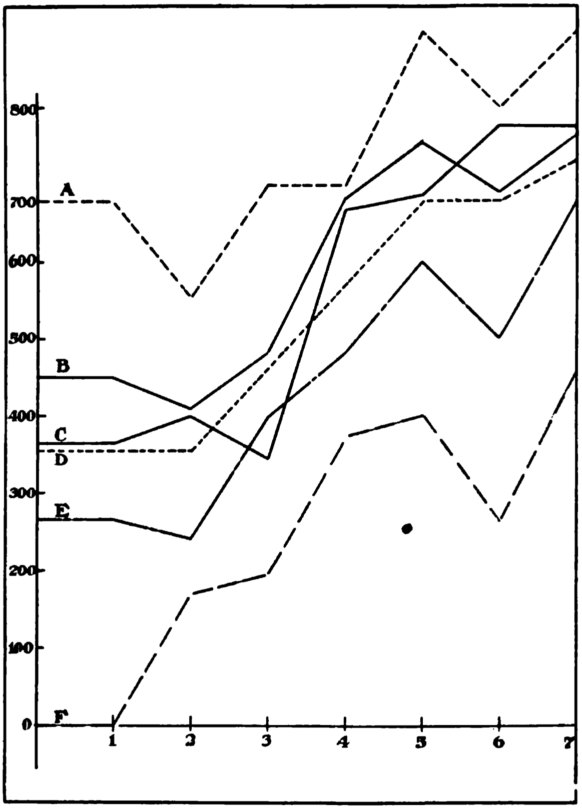


Fig. 51

A and F = Highest and lowest scaling for each composition.
B and E = Limits within which 50 percent of grades fell.
D = Median reading, Teachers' College.
C = Median, Kendallville.

EXHIBIT IV.—COMPARISON OF THE RATINGS OF SEVEN ENGLISH COMPOSITIONS ON THE HILLEGAS SCALE BY THREE HIGH SCHOOL TEACHERS OF ENGLISH AND TWO DEPARTMENT TEACHERS OF ENGLISH

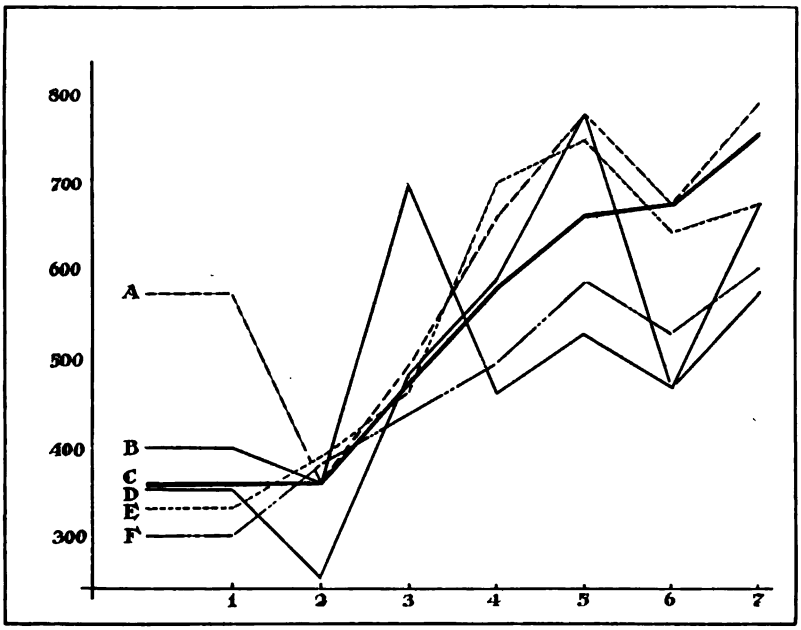


Fig. 52

A, B, D = High School English Teachers.
C = Median of twenty-nine readings.
E, F = Department English Teachers.
1, 2, 3, 4, etc. = Compositions.

C. LAPORTE PUBLIC SCHOOLS

(Data furnished by Superintendent Arthur Deamer)

EXHIBIT I.—EXPERIMENT IN THE USE OF THE HILLEGAS SCALE FOR ENGLISH COMPOSITION IN GRADES 4, 5, 6, 7, AND 8

The children of the fourth, fifth, sixth, seventh, and eighth grades were asked to write compositions on the subject, "How to spend one hundred dollars to please five different persons who like different things." This subject was written on the board and the children were allowed a few minutes to ask questions. They were told to treat the subject any way they wished, just so they made an interesting story about it. They were then allowed twenty-two minutes in which to write.

The papers were then collected and after each was given a code mark to indicate the school grade and teacher of the writer, the papers were shuffled and then graded by a committee of twelve teachers, by the use of the Hillegas scale. This scale was prepared by Dr. Hillegas of Columbia University and contains ten sample compositions rated as follows: 0, 1.83, 2.60, 3.69, 4.74, 5.95, 6.75, 7.72, 8.38, and 9.37. Thus a perfect paper would be marked 9.37, and an incoherent and meaningless one was marked 0. However, for the sake of convenience the decimal was dropped and the scores were marked from 0 to 10. Two teachers' meetings were held to discuss the Hillegas scale and to get the ten samples clearly in mind. Then each teacher was instructed to grade according to her judgment, bearing in mind that the fundamental thing was to discover which one of the ten Hillegas samples the composition under consideration most nearly resembled as far as quality was concerned and to give to that composition the mark that the Hillegas sample bore. After all the papers were thus examined and marked by the committee, three other examiners made a random choice of a number of papers and examined these with the idea of getting some idea of the gradings. In the main the second committee agreed with the first. Some of the papers were grader higher and some lower, and many were given the same rating. The conclusion was that there was not enough difference to vitiate the results since the median scores were to be used.

The children of the same grades in Butte, Mont., were asked to write compositions on the same subject under the same conditions. The papers were also scored by a committee of teachers of that city and the results are attached for the sake of comparison. These data were taken from the Butte survey. Certain fifth-grade classes in Maryland have averaged 5.15, also certain seventh-grade classes in Maryland and New York have been found to average from 5.75 to 7. It is to be regretted that these results were not secured for the entire cities so that they might be used as a basis for detailed comparison.

The following table shows the distribution of the scores by grades, also medians for Laporte and Butte:

GRADE	0	1	2	3	4	5	6	7	8	9	Total	Medians	
												Laporte	Butte
Fourth............	1	10	22	29	36	22	6	2	0	1	129	4.1	2.3
Fifth..............	...	10	30	31	24	27	17	15	1	...	155	4.4	2.9
Sixth..............	1	10	16	15	19	20	14	15	11	1	122	5.0	3.4
Seventh..........	2	4	7	9	21	20	15	17	17	2	114	5.8	3.7
Eighth............	...	1	3	7	5	5	11	11	11	5	59	6.8	4.1
Total.........	4	35	78	91	105	94	63	60	40	9	579	4.8	3.3

Since no definite standards of achievements have been made we do not know definitely whether we are high, average, or low in our ability to write. Certain of our fourth-grade classes went to 4.6, one of our fifth grades made 4.7, one of the sixth grades went to 5.9, one of the seventh grades to 6.3, and the median for the eighth grade was 7.7. The median score for the city was 4.8.

The rate of improvement is gradual as shown by the increasing value of the medians. Considerable individuality was shown thruout by the children in the compositions. There was very little similarity of content among them in the same school, thus indicating that no definite suggestions were made by the teachers as to what should be written. The spelling, punctuation, and paragraphing showed that these phases of the work were not neglected in our schools.

EXHIBIT II.—THE STONE TEST IN ARITHMETICAL PROBLEMS INVOLVING REASONING

The Stone test in arithmetical problems involving reasoning was given two weeks after the beginning of the second semester. The following is the list of problems:

1. If you buy 2 tablets at 7 cents each and a book for 65 cents, how much change should you receive from a two-dollar bill?

2. John sold 4 *Saturday Evening Posts* at 5 cents each. He kept ½ the money and with the other ½ he bought Sunday papers at 2 cents each. How many did he buy?

3. If James had 4 times as much money as George, he would have $16. How much has George?

4. How many pencils can you buy for 50 cents at the rate of 2 for 5 cents?

5. The uniforms for a baseball nine cost $2.50 each. The shoes cost $2 a pair. What was the total cost of uniforms and shoes for the nine?

6. In the schools of a certain city there are 2,200 pupils; ½ are in the primary grades, ¼ in the grammar grades, ⅛ in the high school, and the rest in the night school. How many pupils are there in the night school?

7. If 3½ tons of coal cost $21, what will 5½ tons cost?

8. A news dealer bought some magazines for $1. He sold them for $1.20, gaining 5 cents on each magazine. How many magazines were there?

9. A girl spent ⅛ of her money for car fare, and three times as much for clothes. Half of what she had left was 80 cents. How much money did she have at first?

10. Two girls receive $2.10 for making button-holes. One makes 42, the other 28. How shall they divide the money?

11. Mr. Brown paid one-third of the cost of a building; Mr. Johnson paid ½ the cost. Mr. Johnson received $500 more annual rent than Mr. Brown. How much did each receive?

12. A freight train left Albany for New York at 6 o'clock. An express left on the same track at 8 o'clock. It went at the rate of 40 miles an hour. At what time of day will it overtake the freight train if the freight train stops after it has gone 56 miles?

In scoring the problems the following values were used: Problems 1 2, 3, 4, and 5 were given a value of 1 point each; problem 6 was valued at 1.4; problem 7 at 1.2; problem 8 at 1.6; problems 9, 10, 11, and 12 at 2 points each. Thus a perfect paper scored 17 points. The decimals were dropped on the final markings of the papers. Thus a paper scoring 7.2 was marked 7 and a paper scored at 7.6, for example, was marked 8. This practice was followed in Butte and other cities where the Stone test has been given. If the answer was wrong no credit was given. The children were given 15 minutes to solve as many problems as possible. Two persons did all the scoring.

The following table shows the distribution of the scores with medians for the different grades. The medians given in the Butte Survey are included:

GRADE	0	1	2	3	4	5	6	7	8	9	10	11
Fifth	19	12	31	41	25	14	7	3	1	....	....	....
Sixth	8	8	14	17	31	22	11	9	2	3	1	1
Seventh	1	1	3	6	9	17	13	8	28	14	7	7
Eighth	....	....	....	1	2	12	5	7	9	2	6	5
Totals	28	21	48	65	67	65	36	27	40	19	14	13

GRADE	12	13	14	15	16	17	Total	Median	
								Laporte	Butte
Fifth	....	....	....	....	....	....	153	3.4	2.2
Sixth	....	....	....	....	....	....	127	4.6	3.9
Seventh	6	....	1	....	....	....	121	8.1	5.8
Eighth	4	6	....	2	....	1	62	8.6	7.7
Totals	10	6	1	2	....	1	463	5.1	4.8

The median scores are considerably better than those of Butte, Mont. It is to be regretted that more cities have not applied this standard test. It is true that a number of cities have done so, but in such a way as not to make results comparable since they have given credit for right reasoning when the answers were wrong. Twelve percent of Laporte's fifth grade, 6 percent of the sixth grade, and 1 percent of the seventh grade failed to solve a problem correctly. Six percent of all the children failed to solve a single example.

The following table shows the percents of the total enrollment of the children of Laporte and Butte who solved the different number of examples correctly:

EXAMPLES	0	1	2	3	4	5	6	7	8	9	10	11	12
Butte	7	10	10	12	13	11	10	7	7	3	3	2	2
Laporte	6	5	10	14	14	14	8	6	9	5	3	3	2

In Butte 20 percent of all the fifth-grade children failed to solve a single problem correctly and 4 percent of the sixth grade. The distribution of scores in Laporte was better than in Butte as is shown by the above percentile table. Twenty-five percent of the children made a score of 3 or less, 50 percent made scores ranging from 3 to 7, and 25 percent made scores of 7 or better.

D. MUNCIE PUBLIC SCHOOLS

(Data furnished by Principal Fred D. Lewis)

EXHIBIT I.—ONE HUNDRED THOUSAND COMPOSITIONS SCORED ACCORDING TO THE HILLEGAS COMPOSITION SCALE

During the school year 1914–1915 each child in the city schools above the 2B grade wrote one composition each week for a period of twenty-four weeks. The approximate number of compositions thus written was 100,000. These compositions were all scored by the Hillegas Composition Scale. The weekly scores for each grade in each building were averaged. After the work was completed, averages were made for each grade for the entire city. These averages are shown in graphic form below.

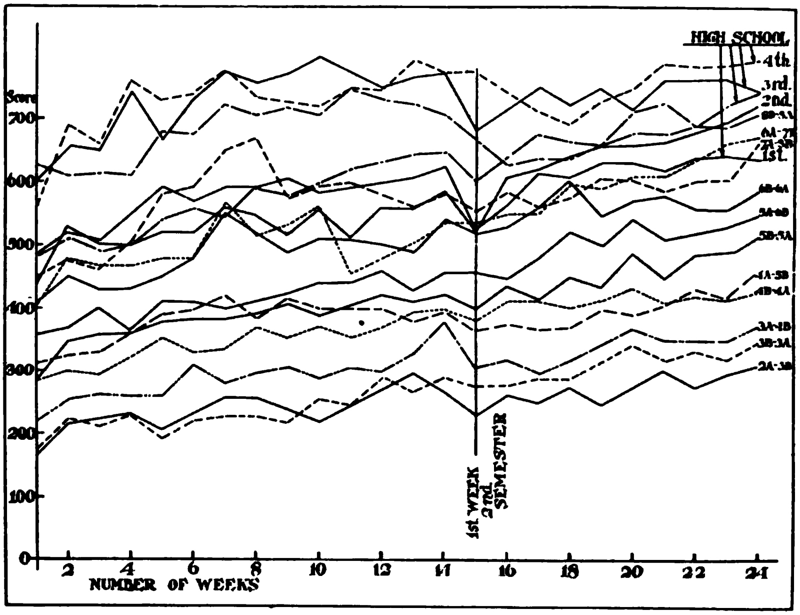


Fig. 53

Twenty-four weeks of practice in English composition in Muncie public schools, 1914-1915. Ordinates: score as represented on Hillegas scale. Abscissas: weeks of practice. Each curve represents score of one class thru the twenty-four weeks.

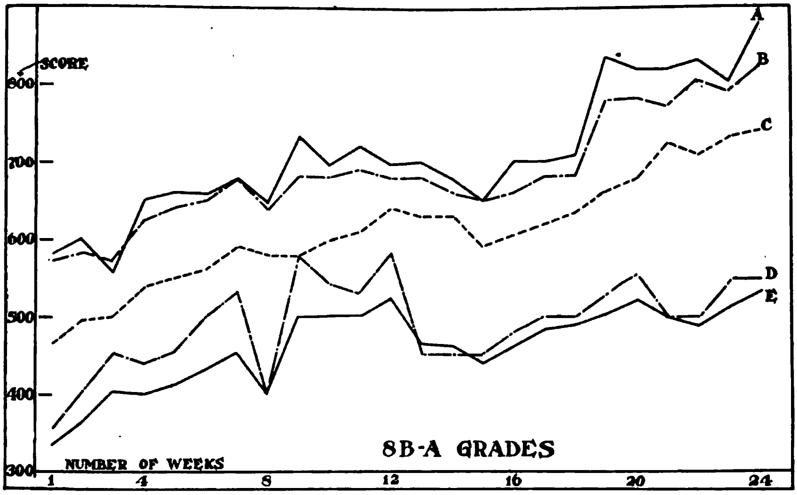


Fig. 54

Weekly practice in composition. Twenty-four weeks. Grade 8. Ordinates: score as represented on scale. Abscissas: weeks of practice.

A = Weekly score of best pupil, graded by Hillegas scale.
B = Same, graded by Harvard-Newton scale.
C = Average weekly score of class, graded by Hillegas scale.
D = Weekly score of poorest pupil, graded by Hillegas scale.
E = Same, graded by Harvard-Newton scale.

E. SOUTH BEND PUBLIC SCHOOLS

(Data furnished by Superintendent L. J. Montgomery, Assistant Superintendent M. W. Willing, and Principal H. G. Imel)

EXHIBIT I.—EXPERIMENT IN TEACHING SPELLING IN THE HENRY STUDEBAKER SCHOOL

This study in spelling was made to learn whether or not there was an actual growth in the ability of children to spell the commoner words that form the basis of the written composition of everyone.

Two tests were given, the first about February 1; the second about March 25. The results of the first are shown on Fig. 55. The results of the second on Fig. 56.

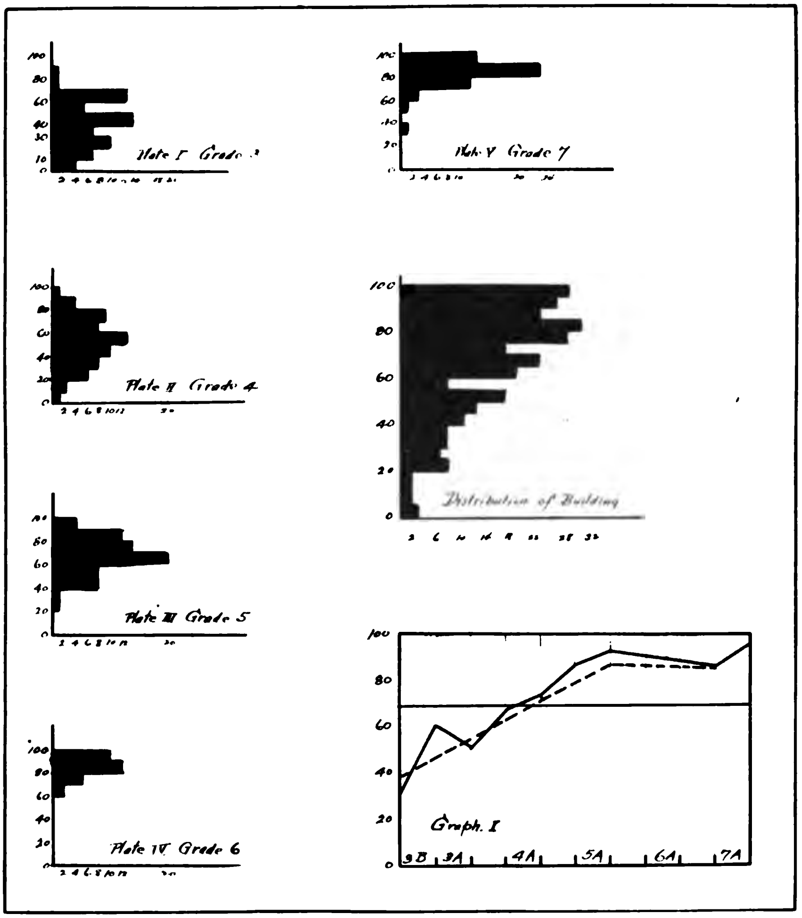


Fig. 55

For the test one hundred words were chosen at random from the second-grade list of the "North Dakota Spelling List" by Dr. Franklin Jones. Without previous warning or study these words were pronounced to the children and spelled by them (written spelling), twenty-five words daily. The incorrectly spelled words were checked on the papers daily. The daily list was then placed on the board and from that each pupil made a list of his misspelled words and was supposed to study these until they were mastered.

This method was expected to eliminate the useless droning over known words.

The total number of misspelled words was placed at the head of each list and the results tabulated, distributed, and medians found for each grade and half-grade.

Fig. 55 shows the results of this test in two ways: Graph 1. Ordinates show percents and abscissas show grades. The solid line shows medians by

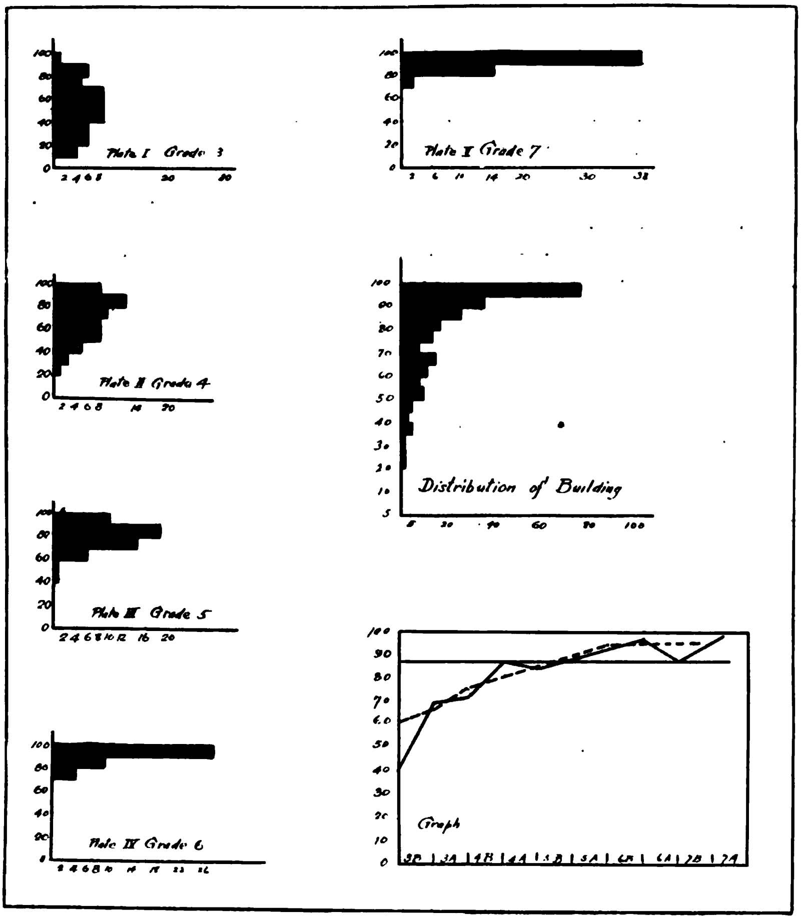


Fig. 56

half-grades, an irregular curve beginning with 37 percent in 3B and ending with 93 percent in 7A. The broken line shows the medians by *grades*, showing a constant upward tendency from third to sixth grades with a slight decline in the seventh grade, due to three or four very poor spellers.

The straight, horizontal line is the median for all the school tested.

The above plates show the distribution of misspelled words in the grades. Ordinates represent percents and abscissas show numbers of pupils.

Plate i. Grade 3 shows that the greater number of children were below 50 percent, ranging from 0 to 90 percent.

Plate ii. Grade 4 shows a range of from 0 to 100 percent, distributed pretty evenly above and below the 50 percent line.

Plate iii. Grade 5 shows a range of from 20 to 100 percent, with the major portion above 60 percent.

Plate iv. Grade 6 shows the range to be from 60 to 100 percent, with a large number from 80 to 100 percent correct.

Plate v. Grade 7 shows an interesting thing in that one very poor speller was alone in being below 40 with a large number between 80 and 100 percent.

Plate vi. Shows the distribution of the entire school tested, the majority of which lie above 60, with the high point between 80 and 85.

The results shown in Fig. 56 were obtained from a test taken March 22 to 25. The same hundred words were used as in the first test and were pronounced to the children and spelled by them (written) without previous warning or review since the February test.

The results were tabulated as in test I, and are expressed in the same way. A comparison of the graph with the corresponding Graph I, in Fig. 55, shows a gain was made in every grade, ranging from 3 percent in 6B to 17 percent in 4A and B. The medians range from 41.5 in 3B to 99.9 in 7A.

Twenty-eight out of 31 pupils in the 7A grade range between 95 and 100 percent, 15 of them having 100 percent.

Plates 1 to 5 show, as in Fig. 55, the distribution of the misspelled words in the grades and Plate 6, that of the building.

It will be noted that the middle point is higher in each plate than in Fig. 55. It is interesting to note the increase in the numbers of pupils ranging from 90 to 100 as the grades go up.

While insufficient work has been done to draw any definite conclusions from this experiment, we feel that the study has been enough to point in certain directions:

(a) There is need of a critical examination of our spelling lists and the methods of teaching them.

(b) There is a lack of ability on the part of our pupils to spell the commoner words.

(c) By studying only misspelled words larger lists can be covered.

(d) Insufficient drill is put on the commoner words that form the basis of our written composition.

(e) Either the misspelled words were not mastered when studied after the test or were quickly forgotten.

(f) There is a constant growth in ability to spell as we go from lower to upper grades.

EXHIBIT II.—EXPERIMENT IN THE USE OF THE AYRES SCALE FOR MEASURING WRITING ABILITY

On February 12, 1914, the first uniform writing test in the South Bend public schools was given to all pupils in grades 2B to 8A inclusive. The test was given by the principals in their respective buildings and consisted in having the pupils write continuously for three minutes this sentence, "Sing a song of sixpence, a pocket full of rye." The quality of the writing was determined by use of the Ayres Scale, the average of the judgments of three individuals being set down on each paper. About sixty teachers were involved in the grading. When this work was completed a tabulation of grade averages for each building and for the system was sent out and the principals instructed in the method of graphing the same. At the same time a standard of achievement for each grade in both speed and quality was proposed to properly direct the efforts of the teaching force.

Three months later, on May 14, a similar test was given. Instructions to the principals at this time were more definite, and designed, if followed closely, to secure the "natural" writing of the pupils tested. This feature of the writing was subsequently checked by comparison with a reproduction test. The papers from the May test were graded as before save that no more than thirty teachers were involved and the third judgment was made in almost all cases by members of the general supervisory force. A comparative tabulation showing the grade averages of the two tests was given out, and certain significant features brought to the notice of the principals. Schools were ranked at this time according to the percentage of pupils equal to or above the proposed standard in both quality and speed.

The May test convinced us of the desirability of somewhat different standards for the grades; standards that might be imposed more reasonably as requirements for at least 75 percent of the pupils. Accordingly in November, 1914, such standards were formulated and given out as "The South Bend Writing Requirements". They were as follows:

GRADE	AYRES QUALITY	SPEED LETTERS PER MINUTE	PERCENT OF PUPILS REQUIRED TO MAKE THESE
3B	40	45	75 percent
3A	40	45	80 percent
4B	40	50	75 percent
4A	40	50	80 percent
5B	50	55	75 percent
5A	50	55	80 percent
6B	50	60	75 percent
6A	50	60	80 percent
7B	60	65	75 percent
7A	60	65	80 percent
8B	60	70	75 percent
8A	60	70	80 percent

On January 14, 1915, a third uniform test in writing was given in all grades from 3B to 8A inclusive. Children were this time asked to write continuously for two minutes the sentence, "When the pie was opened, the birds began to sing." The test was given in every instance by the assistant superintendent and all the papers subsequently graded by him. His markings were made subject to correction by the application of a personal coefficient determined from a comparison of his judgment on a hundred selected papers with the judgments of sixteen principals and teachers. Medians were substituted for averages in the tabulation of results and these were compared with medians derived from the first test a year before. (See Fig. 57). The percentages of pupils equal to or above the "Requirements" in both these tests were also tabulated together. Schools were ranked from the summaries of this tabulation. At this time also a measure was taken of the uniformity of achievement of pupils within each grade. These measures were set down in a third tabulation as "The greatest percentages of pupils within grades whose writing quality falls within two adjacent steps on the Ayres Scale and of those whose writing speed falls within a range of twenty letters per minute." The actual distribution of the grades and of the system were worked out for the benefit of the supervisory force. (See Figs. 58 and 59.)

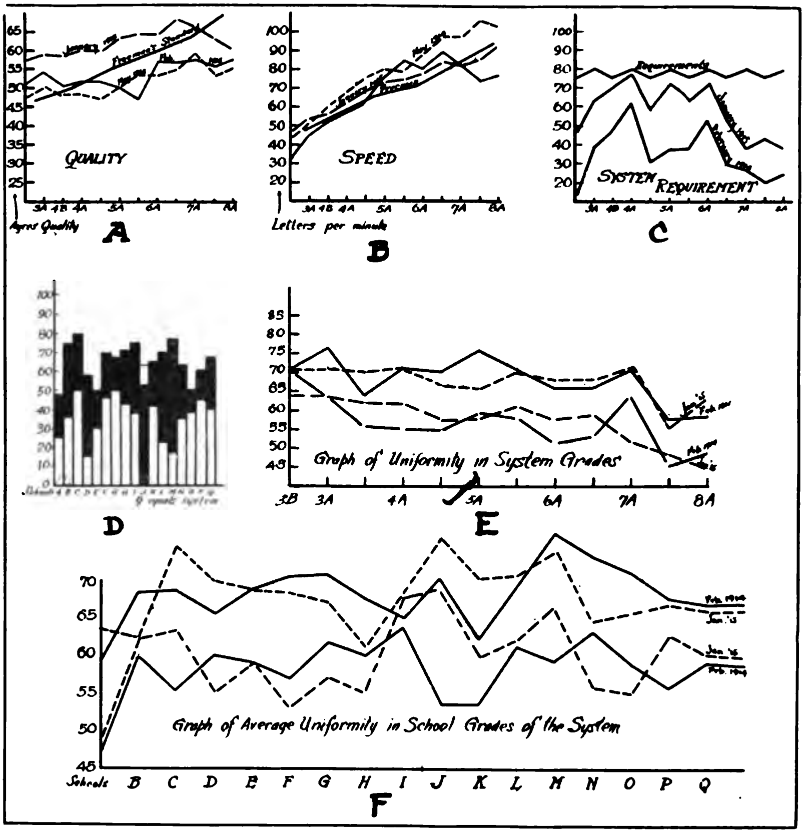


FIG. 57

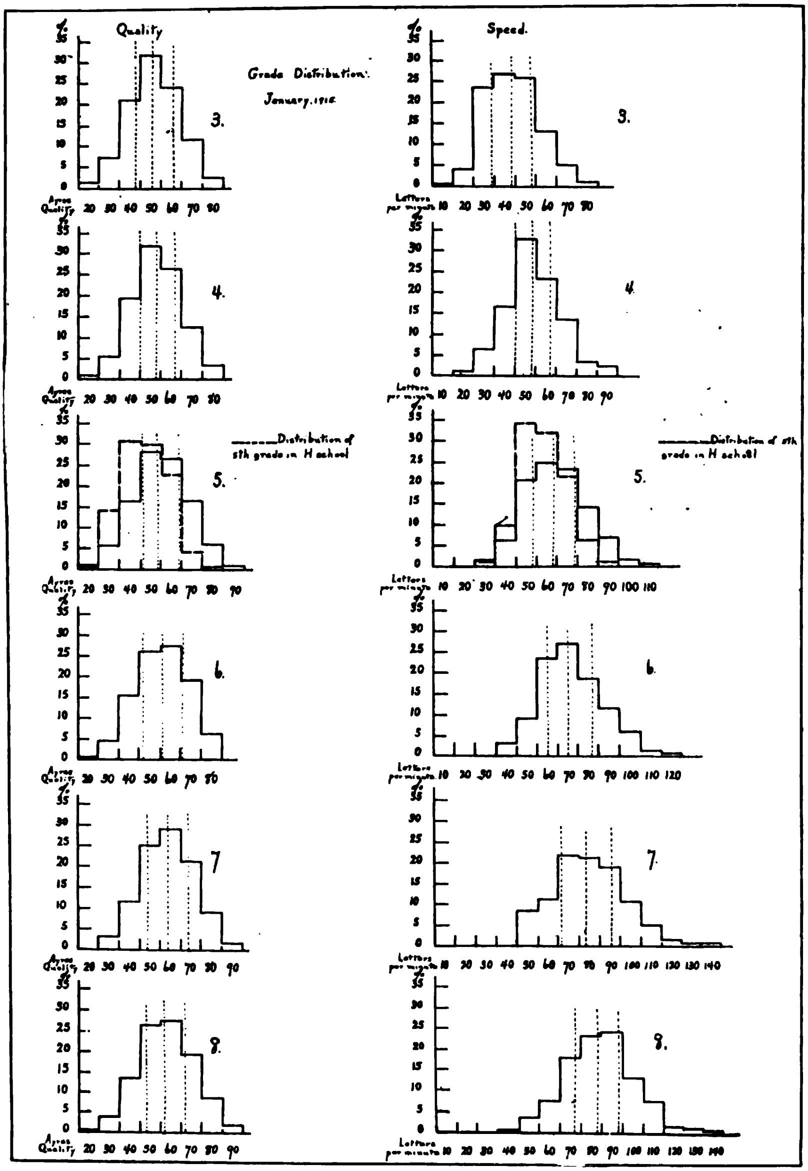

Quality
Speed.
Grade Distribution.
January, 1916
%
35
30
25
20
15
10
5
0
Ayres Quality
20 30 40 50 60 70 80 90
Letters per minute
10 20 30 40 50 60 70 80 90 100 110 120 130 140
3.
4.
5.
6.
7
8.
Distribution of 5th grade in H school
Distribution of 5th grade in H school

FIG. 58

So much of uniform testing and objective measurement in this subject has brought us to the following conclusions:

1. For the purposes of general supervision the reliability varies inversely as the number of people engaged in the testing and grading.

2. The Ayres Scale is of doubtful value without thoro knowledge of its derivation, study of its samples, and comparative practice in its use. With these it becomes a splendid instrument of effective, economical supervision.

3. Principals and teachers need education in the theory and practice of such testing measurement for two reasons—first, for the sake of their own building and room supervision, and second, for the sake of intelligent appreciation of the purposes of the general supervisory force in their use.

4. Grade medians or averages are not at all vital as compared with "percentages of pupils up to standard" or with "variation within grades".

5. Natural handwriting cannot be guaranteed by any kind of a writing test when small groups are concerned. Ordinary composition work should be used as the basis within a single class or building. Speed can then be ascertained by short-timed tests or timed dictations.

6. Such tests do furnish beyond shadow of question a means of efficient and economical supervision.

Read Graph A thus*: The System grade 3B attained a median quality (Ayres Scale) in the January, 1915, test of 58 (heavy broken line), the 3A of 59, 4B of 59, etc. All grades save grade 8 were above Dr. Freeman's Standard.

Read Graph B in similar way. The figures at the left indicate speed in letters per minute.

Read Graph D thus: School A had 22 percent of its pupils up to South Bend Requirements in February, 1914, and 44 percent in January, 1915. School B had 38 percent in 1914 and 75 percent in 1915 (we ask 75 percent of B grades and 80 percent of A grades to be up to requirements).

Read Graph C thus: System grade 3B in February, 1914, (lower line) had only 17 percent of its members up to requirements. In January, 1915, it had 48 percent up to requirements, etc. Approximation to the oscillating upper line is the present aim.

These graphs show the degree of uniformity of achievement within grades; in graph E by system grades, and in graph F by schools.

Read graph E thus: The System grade 3B (average of schools) in both February, 1914, and January, 1915, tests had 75 percent of its members fall within two consecutive steps on the Ayres Scale in quality and 70 percent and 64 percent respectively fall within a twenty-letter speed range. The actual degree of uniformity of achievement in the 3B grade of the System if school divisions are not regarded is much less.

Read graph F in similar way, except to substitute schools (average of grades) for grades.

Read graph at left thus†: Two percent of third-grade pupils were marked 20 on the Ayres Scale, 7 percent were marked 30, etc. Read graph at the right thus: One percent of third-grade pupils fell within a speed class of 10 to 20 letters per minute; 4 percent within 20 to 30, etc. The dotted lines in the fifth-grade graphs outline the distribution of a single school. This illustrates the value of such graphs for the supervising force.

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*Page 218.

†Page 219.

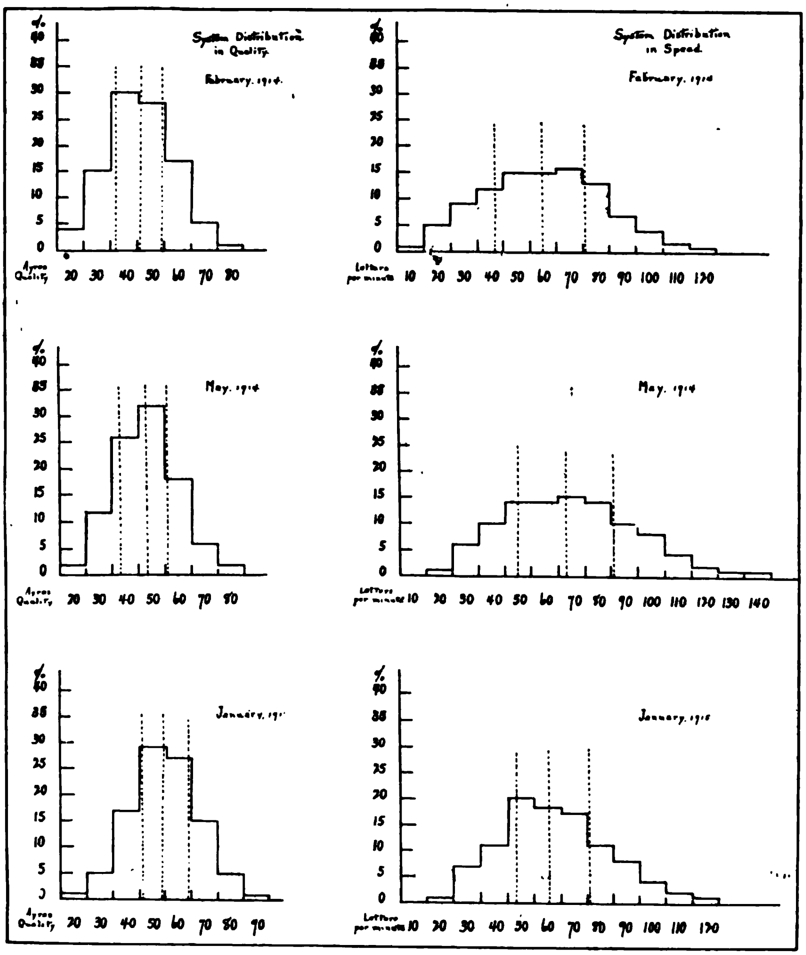

FIG. 59

These graphs show the distribution of the entire system in quality and speed as derived from three different tests. They are read similarly to those in Fig. 58. The dotted vertical lines in these graphs indicate the medians and quartiles.

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Third
Conference on Educational Measurements

FEBRUARY, 1917

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THIRD ANNUAL CONFERENCE

ON

EDUCATIONAL MEASUREMENTS

Held at Indiana University, Bloomington, Indiana,
Friday and Saturday, April 14 and 15, 1916

PUBLISHED BY
THE EXTENSION DIVISION OF INDIANA UNIVERSITY
1917

"THE school survey is a new and distinctive implement of progress. It has come into being for the purpose of educating the public about their schools, and its distinctive function should be preserved. It is a part of our national self-examination. It is the product of civic intelligence and community progress.

"Its object is to make the entire school system pass in review before the public eye. It makes the schools and the public pay attention to each other. It presents the past, the present, and the possible. It is a community stocktaking inventory, and appraisal of its educational assets and opportunities. It aims to place before the citizens a picture of their schools; a picture so accurate that it cannot mislead; so simple that it cannot be misunderstood, and so significant that it cannot be disregarded. It does not always succeed in its aim, but it cannot even take aim in secret or in the dark."—L. P. AYRES, in *Proceedings of Indiana University Conference on Educational Measurements*, 1915.

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Foreword

THE third annual conference on educational measurements at Indiana University has continued in part the lines of discussion inaugurated in the first two conferences relative to the measurement of achievement in certain school subjects. Dr. Thorndike's discussions and demonstrations of the measurement of reading ability at the first conference stimulated investigation along this line by the Bureau of Research, under Dr. Melvin E. Haggerty's direction, the report of which is now being published by the University.

The study on the measurement of arithmetical abilities, published early in 1915 by Dr. Haggerty, and the discussions by Mr. Courtis at the second conference have stimulated further measurement and experimentation in arithmetic during the year, the results of which are now in press.

Coöperative investigations were reported at the third conference by Associate Professor Hubert G. Childs on the cost of instruction in Indiana high schools, measurement of achievement in algebra, acceleration and retardation in certain Indiana high schools, and failures in high schools by years and subjects.

An investigation of handwriting has been undertaken by Professor William W. Black and formed the topic for a preliminary report at the conference.

An important feature of the conference was a practical demonstration in the administration of tests in the Bloomington schools under the direction of members of the faculty of the University School of Education. Such tests were conducted in algebra, arithmetic, English composition, and reading. The test papers were scored by those visiting the demonstrations, and the results were tabulated and interpreted in their presence immediately following the demonstration.

The addresses and discussions conducted by Doctors Cubberley and Buckingham were centered around the general topics of the significance of educational measurements in school administration and the construction and application of standard scales of measurement in school subjects.

Before adjournment the conference expressed its appreciation of the service rendered by the University in promoting these conferences, and requested that they be continued.

Introductory Address

William Lowe Bryan, President of Indiana University

When new ideas are presented, the most important thing is not to agree with them, or to oppose them, but to understand them. Every new movement in education in America is likely to represent some fundamental idea, but every such movement is met by the opposition of those who do not understand it, and is advocated on all sides by those who do not understand it. Every new educational movement is, therefore, on the surface a superficial fad. Thousands of people are crying it up and declaring that now at last we have solved the problem of education, when, in fact, they have no real grasp of the movement which they favor. On the other hand, every such movement is opposed by men who feel affronted because something has come up in which they play no part. If one looks only at the surface, the history of American education is a history of summer cyclones blowing about full of noise and dust until presently they disappear. In truth, however, each of these movements arises because some persons have seen deeply a certain need and a certain way of bettering existing conditions. My appeal to young people who have entered the field of education is not that they shall favor and not that they shall oppose current educational movements, but that they shall strive earnestly to be of those who comprehend the deeper currents of our educational life.

The Significance of Educational Measurements

ELLWOOD P. CUBBERLEY, Professor of Education, Leland Stanford Junior University

It is indeed a pleasure to me to come back to the old University, tho it doesn't seem quite like the old place. In my day we had a few students and a few buildings and much faith and enthusiasm. Now I understand you have many students, many buildings, and many times the amount of faith and hope and enthusiasm that they had in the days when I was a young man here. It is an especial pleasure to come back and find some of my old friends still here.

I feel somewhat diffident in coming to this institution, however, to talk to you on the question of educational measurements and the significance of the movement. In an institution which has done so much in the line of congresses on educational measurements, and where so many publications have been issued which set forth the work and the value and the significance of it all, I feel a little as tho I were carrying coals to Newcastle in coming to talk to you on the subject. Yet, if you will permit me, I should like to gather up what seems to me to be some of the more significant features of this new movement and present them to you this evening.

I say a new movement. It is essentially a new one. A decade will practically measure almost all the work which has been done in the line of school tests, the formulation of standards of measurement, and the attempt to evolve units of accomplishment. A decade hence I think no school man who assumes to be an expert in administration can expect to have any hearing in the educational world unless he is quite familiar with the work of testing, and with the units of accomplishment which will, by that time, have been formulated. He must also be able to apply such tests and standards in the school system in which he is trying to render service.

I say the movement is new. It is as yet in its infancy. We hardly realize ourselves, I think, we who have been most interested in this testing work, the vast significance of this movement for our profession. It means the making of a profession of school administration, instead of the mere job of running a school system. It means the dignifying of our calling; it means the placing of the profession on a scientific basis; and the far-reaching significance of that can scarcely be overestimated. We are now attempting to do in school work what has been done for some time in the business world.

Any business man who is managing a business in which he expects to make profits will have standards from which he will work. He will have measuring sticks to test the efficiency of his output; he will have units of accomplishment; he will have cost accounting systems; and he will have standards of many kinds. He will also have a continual system of testing and working over what he is doing, to find out whether what he is doing is the best that can be done with the money he has at hand, and whether the output is as large as he could well produce with the work and the money he has to invest in it.

In the business world the business man is continually facing the question of justifying his work to his stockholders. The stockholders demand profits; they want to know whether the business is being efficiently managed; and if the work is not being efficiently managed, as determined by the percentage of profit on the common stock, they demand that there shall be some reasons given to them why it is not paying, or else that there shall be a change in the management of the enterprise.

In the school business we have a State monopoly, in which there is almost no accounting. We have been very content to compel children to come to the school system, and then outline a course of study for them which we felt to be good, but which very often was based on past conditions rather than on future needs. After giving such instruction to our children, we have been satisfied to test them by means of an examination, and to trust to the growth process to bring out the kind of development we hoped for. It has been very analogous to the old chance and luck farming, where the farmer looked at the moon, guessed at the weather, put in his crops, and prayed to the Lord to help him thru the season. Today he may do all of those things, but in addition he applies to his work some science; he begins to find out various things which he needs to know; and he introduces a number of scientific factors into his work. These have tended to eliminate the luck and chance farming of the past, and to introduce into the work of farming a large amount of scientific efficiency.

A manufacturer will have specifications. He knows what he is trying to do, and he draws up his specifications according to the needs of the market he is trying to meet. He has a careful system of accounting; he knows what it costs to produce each part of his manufactured output; he knows how much of his output is efficiently manufactured, and how much raw material goes to waste or to the dump pile; and he is continually studying methods to try to reduce such waste, and make some new profit out of it. He is continually keeping books on all stages of the process; he is continually testing each phase of the manufacturing as it goes along, and rejecting all unsatisfactory output; and he is continually trying to find means for improving those parts of the manufacturing process which are wasteful or unsatisfactory. His object is to secure a more satisfactory output, so that there will be larger profits for the business. I suppose the automobile business offers us one of the most easily seen analogies, and one that we can appreciate best. In this a thoro system of accounting and testing characterizes all stages of the process of manufacturing. Costs are figured on every item of the manufacturing process; the producer knows how much his leather costs, how much his bodies are costing; how much his castings are costing; how much bearings are costing; and so on for every phase of the manufacturing process. He is also continually studying his market conditions. He is trying to adapt his product to new needs; he is trying to find new markets; he is trying to find in advance what people want; and he is changing his specifications continually to meet the new conditions he is facing. The systematized way in which this business is managed would rather astonish the ordinary school man. What is true of the automobile business is true of almost every other successful large business.

In our school work very often we have nothing of that kind. Our specifications are not always dictated by the needs of the future; too often they are framed by those who are thinking in terms of the past. We have no unit-cost accounting systems; we do not continually measure the output. An age and grade distribution sheet for almost any school system would show a very large amount of waste in the process of manufacture.

In farming, up to a very short time ago, the manufacturing process went along in a very unsatisfactory manner. Some farmers still manage their farms in that way today, but the farmer who is efficient, the farmer who is making his farm pay, is now a farmer who knows what everything on his farm is costing; whether his cows are paying their board and keep; whether the pigs are paying enough in profits to warrant retaining them; whether or not he can raise wheat at a profit when it sells for a dollar a bushel; whether horses are more economical than machinery for certain parts of the farming work; and the amount of saving that can be made on this or that or the other thing that he does on the farm. In fact, a modern farmer has a long series of bookkeeping accounts, and out of such he can tell whether he would better sell any cow to the butcher or keep her; whether he would better quit raising pigs, etc.

To return to the school, we find many new demands, and new conditions facing us. There was a time, a very short time ago, when in most of our cities the city council tended to divide the money derived from taxation rather evenly between the schools on the one hand and the other branches of the city government on the other. That day has passed, and probably passed forever, and we can look forward, as city superintendents of schools, to an increasing struggle in the cities in which we are working to be able to retain for the schools a proper percentage of city funds. Why? Partly because of the increase in cost of everything, with every city finding that it must increase its budget in order to meet these increasing costs; partly, also, because in many of our cities the question of what results are being obtained from the money expended is being faced by all departments, and the school department is one of those which can answer least satisfactorily.

As a recent writer has said, why should New York City, for example, be spending more money on inefficient teachers, rather than on efficient subways? Why should it build more schools instead of doing more for the sanitary conditions of the city? Why should it provide better pay for school janitors, rather than provide for more milk inspectors? Why should it try to do more for children in lines of education, rather than improve the milk supply and save the city's babies?

In almost all the lines of work mentioned it is possible to put before a city council perfectly definite facts; that is, so much money spent upon the protection of the milk supply meant a reduction of so much in the death-rate of children last summer; so much spent upon sanitary conditions meant an equal decrease in the sickness rate and death-rate. The school man almost alone has been without such figures.

Again, the increase in the cost of everything is going to make us look, with greater care, upon our expenditures. Are we spending our money well? Are we not spending much money in unnecessary duplications? Are we not indulging in a large number of very costly luxuries? Are we doing the best we can with the money we have at hand? Now to know those things involves some system of accounting, of a type which we have not as yet introduced, at least to any extent, into our school systems.

Up to a very short time ago our chief method of measuring a school system was the method of personal opinion. You go into the school system of Superintendent Jones and look it over and say it is quite poor; I go in and I say it is quite poor, too. We both agree; therefore it must be poor. On the other hand, I go in and say I don't think it is poor; it has some weak points, to be sure, but I think it is very good. Now it becomes a question of your opinion against mine, and mine against yours, and people will believe whichever side they happen to favor, or whether they know you or know me. Such a method of estimating by personal opinion will never get us very far.

Within the last decade or so we have introduced another method which has much more promise—the method of comparison. By this we take the different cities of the same class in size, children in school, wealth, and so on, and compare them upon a dozen or twenty different items. After making such a comparison you say thay a city stands sixteenth out of 20 from the top in this item; it stands seventeenth in this one; in stands twelfth in this item, and so on.

This is very much better than the method of personal opinion, but it is defective in that you are continually comparing with the average of a kind. The average has the defect that you are continually measuring yourself against mediocrity; you are striking the average, or the median, and you are finding out where you are with reference to this average or median, and in a series of, let us say, 20 schools, the average or median may not represent a good system at all. Perhaps all below the average or median are poor, and perhaps even a portion of those above are not doing what they should to be progressing. The real progressive cities are in the upper portion of the group, and it is there that you should measure yourself, rather than by the average of the lot.

The third method, to which we are coming, is a method of setting up standard measurements and units of accomplishment for the measurement of the work of our schools. This whole movement has been evolved very recently. Perhaps a decade, as I said a moment ago, covers it all. We began with writing tests and spelling tests. Then we evolved a composition test. Next we secured arithmetic tests—tests for the fundamentals, and tests for the reasoning side. Then came drawing tests, reading tests, and so on. Today tests in almost all of our elementary and in many of our high school subjects are being evolved.

In addition to these we are beginning to get standards for measuring teaching efficiency. We are also getting a reliable scale for measuring the intelligence of children. We are getting very good measures of retardation; we are beginning to set up standards of the usefulness of the school subjects which we are teaching; and we are beginning to get standards for cost accounting, not only for subjects, but for schools, buildings, fuel, janitor service, etc.

In other words, we are beginning to measure not only the output of our factory, but the cost of the output as well. In the evolution of those standards we are, I think, making progress along the lines which the business man has found so useful and so efficient. We are also beginning not only to get tests by means of which we can go in and test up and see where a school stands, but we are beginning to evolve some units of accomplishment, and units of accomplishment naturally come as a corollary to the tests themselves. By tabulating the results from a large number of school systems we begin to find out what is about the average for a school system. By applying the tests to people in life outside we try to find the needs of common life in terms of these tests, and out of such study to evolve in time a series of units of accomplishment,—a series of standards for work of the different grades which will enable us to say that we have done, or that we have not done, what might reasonably be expected of us for the children in the eighth grade, or the seventh grade, or the sixth grade, or wherever we may desire to question school accomplishments.

For example, in spelling we have now evolved rather reasonable and fair standards by which to measure a school system, and now we are in turn beginning to evolve better spelling books, worked out on a much more rational basis. Many of our spelling books have run as high as 8,000 to 10,000 words, whereas we are finding we don't need any such number at all, and that perhaps 3,000 or 3,500 words would be sufficient to teach the children in all of their eight years of the elementary school courses.

A series of spelling studies has been made in various parts of the country, and these have been tabulated recently. A series of investigations has been made of business men's letters; a series of investigations has been made of the letters which farmers write to the agricultural colleges, and various other types of spelling investigations have been made, and when all have been compiled and put together, the surprising thing is that the number of words which occur two times or three times is relatively small—less than 4,000 in all—and those approximately 4,000 are now being compiled into a spelling book which will represent what we might call the maximum for the work of our elementary schools.

Again, in writing, thru the Ayers and Thorndike scales we have evolved something of a standard of what a child ought to do. We feel fairly well satisfied that a child of the fifth grade ought to be somewhere between 11 and 12; in the sixth, somewhere near 12½ or 13; and so on with the different grades, and the children can measure their own writing by such scales if they wish to do so.

In arithmetic also we are beginning to get some standards of accuracy and some standards for speed. In a recent investigation, published in the last "Yearbook of the National Society for the Study of Education", Mr. Courtis tells of a small investigation which he made with a number of clerks in the Wanamaker store in New York. He was trying to find out what was the standard of accuracy demanded by the work in the Wanamaker store. After we have greatly multiplied such investigations, and have combined the results, we can begin to say what are the standards of actual business life which we in the schools ought to be meeting.

Now perhaps I can best point out to you the significance of all of this by telling you a rather interesting story of the schools of Salt Lake City. I was recently asked to direct the work of a school survey there. One of the actuating motives for that survey was the persistent complaint of the business men of Salt Lake City that the children could not write; that they could not spell; that they could not cipher; that they could not read; and that they could not compose. That complaint had been so persistent and had been made for so long that the schools had gradually come to emphasize reading and writing and composition and arithmetic out of all proportion to their relative merits. The time allowed for all of those subjects had been gradually pushed up, more words had been put in to be spelled, more problems to be solved, and more composition work to be done. As a result, when the schools were measured and compared with other cities in the United States, Salt Lake City stood nearly at the top. Their spelling allowance of time was running 125 to 150 minutes a week, whereas 75 minutes is regarded as ample; they were doing a grade of spelling and on a type of words for which there is no real demand; their writing was excellent. In reproducing the median writing samples in the Report we said that the business man was respectfully requested to put a sample of his own writing by the side of the median sample for the seventh and eighth grades, and see where his own writing stood. In arithmetic they were doing good work; in reasoning they were very good; in composition they were good. In other words, the school, in response to persistent complaint from the business man, was entirely overdoing the so-called fundamentals. They were doing more than there was any reasonable right to expect the schools to do, and children were attaining an efficiency which business life probably does not demand.

The studies which have been made on retardation, which began earlier than those with the school tests, have shown us that every school system is guilty of a large waste in production, because many children are hopelessly mired down in the grades with almost no hope of ever making progress. They are discouraged and see little chance of ever amounting to anything, because the school is trying to put everybody thru the same kind of a process. Instead of adopting the business man's method, and employing a number of specialized pieces of machinery and specializing phases of the manufacturing process, we are using one type of machinery and trying to put everybody along the same line, instead of developing different types of schools and different types of teachers to meet the different types of requirements which are presented by the overaged, the non-English speaking, those of low mentality, the troublesome cases in discipline, and those of various kinds of peculiar ability which we meet with continually in our schools.

In the matter of costs, also, we are beginning to get some units which are of value. Why should a classroom in one city cost $8,000 to erect against $4,000 in another? Why should it cost four times as much to heat a classroom in one building as it does in another? It may be perfectly explainable, but it is something that should be looked into. If we find Greek, for example, in our high schools is costing us, let us say, $300 for 1,000 student hours, and the other subjects of the high school are all costing less than $100, might it not be a legitimate question as to whether or not we should keep on teaching Greek, unless we can do it in a more economical way? And so I might go on enumerating large numbers of other cost phases of the cost problem.

We might find, for example, that the cost for supplies in the school system averages 64 cents; that in one-third of the buildings it was over 90 cents; in another third of the buildings it was less than 20 cents. A very legitimate question would be whether or not we are providing too many supplies on the one hand, and whether or not we are not inadequately supplying those building which are costing us less than 30 cents. Ought there not to be a speeding up of those schools in the matter of expenditure; especially would this be the case should we find that that low expenditure is correlated with a high retardation?

During the past ten years a large number of statistical studies has been made; they are so numerous that one can scarcely keep track of them. As a result, we have accumulated a lot of medians, graphs, and a lot of statistical data. Sometimes, when I read reports of superintendents, it seems to me that they have done little more than accumulate graphs and medians and statistical data. In themselves those things amount to little or nothing; it is the interpretation we give of them that is the valuable thing. What we want continually is to interpret the results of these studies. What do your graphs mean? Where is your median compared with what it should be? What do your statistical tables show you as to needed changes? Do they indicate that you are making substantial progress, or not? Do they indicate that too many things are being done, or too few? Do they indicate that you need additions, or eliminations? Do they indicate that progress is being made, or that you are slipping backward? What change in procedure—in the process of manufacture—should you make? What further specialization in the process of production should be effected? What possible economies can you make in your school system? That is, it becomes practically the business of the superintendent to become the superintendent of a business. In a sense his business is the business of manufacturing as good brain power and as high a degree of intelligence as is possible with the money which he has at hand. Of course, I am keenly aware that there are two sides to school work. There is one purely objective side, which we may test and measure; there is another side that is subjective, that is personal, that is inspirational, which we can't test in any such way. Still I have a very deep feeling that the school system which is doing the objective things well is probably looking after the subjective things in a good manner also, and that the school system which is doing the objective things unintelligently, overdoing them or underdoing them and not knowing why, is probably not doing the subjective things so well as they might be done.

As I said, the superintendent of schools needs to become the superintendent of a business. In altogether too many school systems what we need is a speeding up of the whole educational process. What we need is the introduction of a large number of new pieces of specialized machinery in order that we may specialize the production to meet a large variety of markets. There isn't just one market to meet. The people of a city spending, let us say, $2,000,000 or $3,000,000 on their schools are the stockholders of a large enterprise, and the superintendent of schools is the manager of the business. It should be a very large part of his business, and it should be a very large part of the business of the stockholders as well, to see that it is his business to interpret to the community the progress, the successes, the failures, and the lines of improvement of the business undertaking which he is directing.

Now what is the significance of all of this movement to three different classes of people: first, the teacher; second, the citizen; and third, the superintendent of schools?

To the teacher it seems to me this new movement means a very large amount in the future in peace and contentment and personal satisfaction with her work. It means concise and definite statements—eventually; perhaps not soon, or perhaps not at once—but it eventually means precise and definite statements as to what the teacher is expected to do along the purely objective lines. Along the purely subjective lines, such as inspiring a love for literature, developing patriotism, and awakening high ideals and ambitions, we can't of course measure things in this way, but along the definitely objective things of the school we can lay down irreducible minima, and we can also lay down maxima beyond which the school system will not be expected to go.

The investigations recently made in Boston are illustrative. They have found in English, for example, that these things need to be insisted upon: that a student should be able to copy prose from dictation, and copy it accurately; that the student should be able to copy accurately, from a copy placed in front of him (or her), a bill containing a dozen items; that the student should be able to write a satisfactory letter of application for a position; that he should be able to write a simple composition, upon some simple subject of his own choosing, and write it with proper punctuation, paragraphing, and capitalization; that the common errors of the common parts of speech, especially those of the verb "to be" and a few other common verbs, should be eradicated; that the student should know the common parts of speech, and be able to recognize them in sentences; that the student should be able to stand and read intelligently simple prose, so as to carry meaning and conviction to those who are listening; that the student should have learned and be able to quote at least fifty lines of good classical prose or poetry; and that the student should be able to stand upon his feet before the class and make an oral presentation of some subject which he has looked up and is interested in. If the students finishing the eighth grade can do those things, they say—that is, if all of the preceding teaching of English has by the end of the eighth grade reached that standard of usefulness by means of which a child can do those things—that these should answer for the needs of life and for the needs of the business world. Whether or not that is a final standard, even for Boston, we may seriously question. Whether it is the one we should accept generally may also be seriously questioned. It is, however, an earnest attempt on the part of a single school system to work out, for its own needs, some definitions of units of accomplishment and maxima that may be insisted upon in the teaching of a single subject.

They are also trying in Boston to find out what useless knowledge is being taught. They are finding, for example, that quite a large amount of the geography taught is of no real value. It does not interpret anything to the child; it is soon forgotten; and it is of no particular value. Again, what is the use of teaching a large number of arithmetical processes which we shall never use? I should like to ask you, outside of your business as teachers, how many of you, in the last ten years, have had use for any arithmetical processes other than addition, subtraction, multiplication, division, simple and decimal fractions, and a little interest and percentage? You have had very little.

As we begin to develop units of accomplishment we also help the teacher in that we can give to the children some standards by which they may test their own work. Just as children in city systems where writing scales are hung up in the classrooms are continually going up and testing their own writing, so they may be able to do in time with other subjects in the curriculum which are capable of objective measurement. If a child in a city school system says that he has achieved standard 11-A on a Thorndike writing scale, and, if we know what a Thorndike writing scale is we know exactly how well the child can write. If, however, he tells us that he received 93 per cent in his report last term, what idea have we as to how well he can write? The statement would mean nothing because it is not expressed in any generally recognized standard. So, for the teacher, the movement promises to offer standards which she may use with her pupils, and say that whenever a pupil comes up to standard 12, or some other unit of accomplishment, the pupil may then decrease the time spent on the subject and go on to other work.

It will mean, too, an ultimate differentiation of training for the different pupils which teachers now have, and the specialization of production with our children, which will be worth very much in education.

Again, standards for school work will be worth much to the teacher in the line of vocational guidance. Superintendent Bliss, of Montclair, N.J., reproduced, in the last "Yearbook of the National Society for the Study of Education", diagrams along this line, for a child who was found to be somewhat feeble-minded, for his work in writing and in arithmetic. There was no possibility of training that boy ever to reach any good standard in arithmetic, and it was foolish to try to do so. He should be trained in the things he could do; trained to make himself as self-respecting as possible, and able to care for himself. If he never reaches higher than the mental standard for a twelve-year-old child, he still will have some ideals of self-respect, some desire to do whatever he does do well, and the ability to go out into life and earn his own living, take care of himself, and not be a burden upon society.

From the standpoint of the citizen, the whole school standard movement means the erecting of standards by which he can estimate the efficiency of a school system. In a book which I published recently, "Public School Administration", I drew an analogy, in one of the chapters, between a board of education and what it tries to do, and a board for hospital control and what it tries to do. I took a school board of 12 men and divided them up into committees which were perfectly descriptive of present city school conditions. Then I conceived that this same board of 12 men had been elected, not to manage a school system, but to manage a municipal hospital, and then divided them up analogous to hospital committees. The committee on kindergarten was replaced by one on the maternity ward; the one on supplies by one on drugs and instruments; and so on down thru the list. I now conceived that these committees proceeded to manage the hospital, and to assume over the superintendent of the hospital and the nurses the same degree of authority which similar committees now exercise over the superintendent of schools and the principals and teachers. I leave you to imagine the result.

Once we work out objective standards for accomplishment in school work the citizen can be made to understand when there is mismanagement in a school system, as he now can understand it in other lines of public control. He has had up to now, however, no standards by which he could tell whether a board of education is outrageously mismanaging a school system, or whether a superintendent is of any value whatever or not fit for his job. If the superintendent of schools goes to church regularly, is a "nice fellow", speaks well of everyone, is very cautious and keeps out of trouble, and when he meets a mother with a child says, "Now, that *is* a baby",—he has too often in the past been able to get along very well and hold his place for years and years, and yet do very poor work in the school system. We have had almost no standards for measuring up his work or evaluating his services. Once erect a series of objective standards by which you can tell, not only when the children in the schools are making progress, but from a cost accounting system when expenditures are well apportioned, and the citizen has something which will be useful to him and will enable him to find out whether or not the school system is giving value received for the taxes which are paid for its support.

From the standpoint of the superintendent, in the third place, the evolution of educational measurements means the changing of education from guess-work to scientific accuracy.

We "guess" that we are not making the progress in arithmetic we should, and in consequence order teachers to add 50 minutes a week to the arithmetic time. We "guess" that we are not making proper progress in spelling, so we add a large number of supplemental words. We "guess" that our writing isn't as good as it ought to be, so we increase the time from 20 to 25 minutes a day. And so we "guess" all along the line. Given definite standards for work, a superintendent can then say to his board and to the people: "Our schools have already reached and passed the standards which are generally recognized by the men of my profession as being the standards which children of such age or grade should attain. Our children are able to do such work, and do not need more drill." He then has something tangible by means of which to defend himself.

It means in turn much larger demands upon the superintendent. It means much better professional training, and I am thoroly convinced that in a decade from now our universities and our colleges of education will be giving a training for school administration of which we scarcely dream today. We are accumulating information so rapidly that one who is a master in his craft will need to be a constant student, just as a good doctor or a lawyer is; he will have to discard politics; he will have to discard favoritism and "pulls" of various kinds; and he will have to come to a scientific study of his work, and be able to stand up and defend his work on the basis of the standards and units of accomplishment which the men of his craft have set up as being those which should be used.

It means the changing, then, of school administration from a little local job, to which we can still elect an old and deserving lawyer, as was done in one of our cities not long ago, or to which we can promote a member of the school board, as was done in another city not long ago, and the transferring of school administration into a national profession, in which the superintendent will be a citizen of the nation engaged in the work of managing schools, just as we today have national characters engaged in managing automobile factories, or steel plants, or railroads, or any other form of large public business. Then he will be selected because of his expert knowledge; he will be held to strict accountability for results in terms of standards; and he will be expected to secure expert results. In other words, he will be transformed from a politician into a social engineer.

It means, I think, the end of the day when a book man or a contractor who doesn't like a superintendent can come into town and "get his scalp", because the superintendent will be able to defend himself in terms of the standards which are recognized in his profession. It will also mean that school superintendents will be subjected much less to the whims and local foolishness to which superintendents in this country are now too often subjected.

Round Table: Standard Tests in the Work of School Administration

Led by Ellwood P. Cubberley

As I said last evening, what we are trying to evolve is a series of objective measurements for the perfectly measurable things in our school systems. As I also said last evening, it seems to me that in the near future not only superintendents of schools, but principals of schools as well, will be expected to use scientific measurements—instruments of precision—as means of finding out how effective their work of supervision is.

As I have gone about from place to place on school surveys I have always been struck with the general weakness of the elementary school principal. I remember in one city which I surveyed some 35 teachers had just been dismissed from the school system. After much newspaper criticism the board appointed a committee to go around and investigate the reasons for the dismissals. The committee heard evidence in each of the school buildings, the evidence being taken down by a stenographer. I examined this evidence carefully, and it seemed to me that altogether too many cases indicated that it was the principal who needed to be dropped, rather than the teacher. The charges which he had made against the teacher were charges which showed that he himself was not up to the job of school supervision in the way that he should have been; that he wasn't handling his problem properly; and that he really didn't know what was going on or not going on in his schoolrooms. He was handing out chalk, keeping the keys, looking after the textbooks, making up statistics and time schedules and things of that type, and doing the easy work, but so far as helpful supervision to the teachers of his building was concerned he wasn't giving such at all.

As I said last evening, we have now evolved tests which are perfectly definite for a good many of our school subjects. For example, in writing it is now very easy to see at what point in a scale a pupil or class is writing. Some of our school systems have made up writing scales of their own, following Ayers or

Thorndike standards, but made up from the work of pupils in their own schools. These may be just as useful as the standard scales, and may stimulate more interest. Some of our schools, too, are in the process of evolving composition scales which are improvements over either the Hillegas or Harvard-Newton scale. We might go on and enumerate other subjects in which school systems are evolving their own scale standards for the judging of the quality of work done by the teacher in the classroom. These show the teacher where she needs to put further emphasis, where things need to be done or where they don't need to be done, and they reveal to the teachers that their teaching is effective or that it isn't effective, or that it is somewhere in between.

Now, as I understood it, this morning was to be a round-table discussion, and I wasn't to do much of the talking. It seems to me that perhaps I could do best, after having made this preliminary statement, if I called on some of you to tell, very briefly, how you are using the standard tests for the purpose of checking up your supervision. In other words, how are you using them as a means of supervision if you are a superintendent, as a principal if you are a principal in a school? How are you using them in order to check up the teaching in your schoolrooms, and what are the results which you are obtaining? I don't mean statistical results. I mean brief general results—what you are getting, what they are showing you, and what your teachers are getting out of it all.

May I not first ask for some volunteers who will tell, in two or three minutes, what they are finding out, and how they are using the tests? The floor is open to anyone. I am at somewhat of a disadvantage in not knowing you, otherwise I would call your names. I see my old friend, Mr. Weir, in the audience. He is, I believe, a supervising principal in Indianapolis. May I not ask him to tell us, briefly, what use he has made of these tests in school supervision?

MR. WEIR: I will say it is a little unfortunate for me to be present. Dr. Cubberley, having known me as a boy, thinks I should know something about supervision of schools as a man. Well, in Indianapolis we have a special system of supervision of schools, a supervising system, perhaps, that is different from many systems thruout the country, there being eighteen supervising principals for the various schools. We are of course keeping in touch with the various measurements which are being made—various systems of measurements—and working somewhat in connection with them.

However, we have not tried out many of these systems of measurements. At the present time we are giving the Courtis tests—the first systematic work we have done as supervising principals. Many of us have attempted some systems of measurements for ourselves. In my own schools I have used the Thorndike test in writing, and have found it effective in just the way in which you mentioned, the children making their own comparisons. It has been very interesting to watch them making the comparisons of their own penmanship with the Thorndike scale. Other than that I have not done work in my school along those lines.

MR. MYERS (of Bloomington): I might say that this is my first year in connection with the Bloomington schools, and quite a little of the work that has been done before by my predecessor has been followed out by the teachers who are now in the corps. The Ayers scale has been used a great deal in assisting pupils to get some standard of their own work in writing, and a great many of the tests that have been carried on by the School of Education of the University have been carried on in the Bloomington schools. The results of these have been seen; weak points have been found out; and the teachers have endeavored to improve where the tests showed weaknesses.

Now, to get the specific part of that, I think, Professor Cubberley, if Miss Kerr, the principal of the Departmental Building, is present, she could give a number of these things more in detail than I could, and I should be pleased to yield the floor to her, altho she hasn't known I am intending to do this.

MR. CUBBERLEY: Will Miss Kerr be kind enough to tell us of her experience?

MISS KERR: Our work in the Departmental School in Bloomington, consisting of sixth, seventh, and eighth grades, has been chiefly for the last few years on the Courtis tests. We have used the Courtis tests as a means of finding out where we were, in the first place, and then, after having studied our results as carefully as we were able, to determine upon some procedure to remedy the defects as we found them. Last year, for instance, we gave the Courtis tests along in February. We found that our particular weakness was in addition. We decided upon a systematic drill in addition to remedy the defect, if possible. We worked on that for 6 weeks, giving 5 minutes a day.

Exactly the same method was used in all classes with all children. We gave the Courtis test again at the end of the sixth week to determine whether or not we had got the thing we had worked for. We found, when we measured our school with it, that we had made great progress. When we measured our school, or compared our school, with the twenty Indiana cities upon which Dr. Melvin E. Haggerty based his report in the University "Bulletin" last year, we found that no school system in Indiana came anywhere near what we could do in addition.

I gave a preliminary report on this study last summer to one of Dr. Haggerty's classes. I was asked at that time if this thing was permanent; would it hold? We didn't know then whether it would or not, but we gave the Courtis test again as soon as school opened in the fall to see whether this held. We found that we had 294 children then in the department who had taken the two previous tests and who had had the 6 weeks' drill. We found that, taking the median for the 294 children, irrespective of grades, and throwing them in one large distribution, the children had maintained a gain of one whole example in addition, showing, I think very conclusively, that the drill for at least 66⅔ per cent of the children had had a permanent effect.

You might wonder whether they had also made any gain in subtraction, multiplication, and division. They had made none. They were practically where they were, and in some cases had dropped back. But we feel that, for at least two-thirds of the children, we have given them something permanent.

That is the use we have made of the Courtis tests—attempting to find out where our defects are, and using some remedial agency.

MR. CUBBERLEY: May I ask you to tell what effect the use of these had on your teachers? How did they take them, and what were the results from a supervisor's point of view?

MISS KERR: That is the best thing, I think, that came out of it; the fact that these teachers have been shown conclusively thru their own work—they did the scoring, by the way, they did the major part of the work. This is the thing that has been emphasized for them, the biggest thing—the individual differences in these children. I think they worked with their children more intelligently because they do know that sitting before them here may be a group of 30 eighth-grade children, no two of whom are alike, and, because they have learned this thing thru this objective work which they did with the children, they can be more patient with, and work more intelligently with, the capability that each child brings to the class.

MR. CUBBERLEY: You have brought out a very good point.

MR. MYERS: In the work that Professor Haggerty presented last evening I was very much interested in the school number of Bloomington; there were 2 or 3 places that it was above the median line, very distinctly; there were 1 or 2 places that were below the median line. Now we will be very much interested in seeing what can be done to remedy that defect as shown by that study. I just wanted to mention that. That is the way we try to use the tests.

MR. CUBBERLEY: That is a good point to bring out. We discover as a result of our work that certain things run above, certain things are much below median. Then you have reason for bringing up some, and perhaps for stopping your emphasis on other points; that is, you have brought the work up enough there, so stop and put your emphasis on some other side.

Mr. Horton, of Mishawaka, I understand, has done some work of which we should like to have him tell us.

MR. HORTON: I have done my work not as superintendent of schools at Mishawaka, but as principal of the high school. I want to speak first as chairman of the Research Committee of the Northern Indiana State Teachers' Association. Now we have been determining the policy of research which we think will best meet the needs of the high schools of the State, and Professor Childs has been kind enough to work out the different studies we thought would benefit the high schools. This year we determined to study unit costs, and to take up some one phase of that. There had also been some preliminary work done on supervised study.

The results of the unit-cost test, the preliminary results at least, you have seen, and we expect to continue that study. The algebra tests we expect to continue, and to try to perfect a test that all of the high schools can use, and to arrive at some standards in that.

Now as to the supervised study, only about 3 or 4 schools could experiment on that. We have been experimenting on it, and we started in with a 60-minute period. The recitation was to take place in the first 30 minutes; in the last 30 minutes the time was given to supervised study. The recitation was to end somewhere within the first 30 minutes. Then we have been keeping figures on the efficiency of study for say 5-minute units, and on the fatigue curve of students for the study, and on their efficiency for study at different times of the day, and so forth. Then we have been keeping comparative results of our supervised study, as contrasted with the study under the old plan. We have some definite figures on that line. Those were presented at the high school section of the Northern Indiana State Teachers' Association in Chicago.

Now as to tests in the high school. I have been experimenting with some tests with the idea of furthering the work of this research committee. One thing we have in mind, I think, that is very liable to have tremendous results on the high school work, is to get together the groups of men in the high schools in different States that have been doing this kind of work. That is, there is a group of men in Illinois that have been doing work on tests, and there is a group of men in Iowa, and there is a group of men in Wisconsin, and there is a group of men in Indiana, and we have been trying to get the work of these different groups of men together, so that when we work out a standard test, or a certain line of investigation, that that can be used thruout the North Central schools, so that we will see where we stand and where all of the schools stand in relation to that.

MR. CUBBERLEY: Will you not tell us briefly how you have used this in supervision, which is our main point this morning; how you have used this in the supervision of your teachers?

MR. HORTON: In the supervision of my teachers I have the normal curve of the distribution of ability for our grades. I have had that for the last three years. I think that has accomplished wonderful results. We apply that to our grading system; we have it also; and we use the normal curve of the distribution of ability. Then I have the teachers make reports of how their class stands under that normal curve of distribution as it has been threshed out on the screen two or three times. That has been a wonderful thing in standardizing our grading. That is, it makes an *A* mean a certain thing, a certain standing in the class, so that the grades of the students mean a very definite thing. A teacher can't skew that to, at least, any large amount.

Then we have used the reading tests. We used the Thorndike reading tests on a group of students that we thought were rather behind their grade, and it showed definitely that they were behind the standard of the Thorndike reading test. We are going to use the Kelly reading tests, too, and try those out on the same section.

Our Latin department is going to use the vocabulary tests. We are just investigating a copy of the Latin and German vocabulary tests at the present time, but we are going to secure those for use in our classes, and try them out.

We are starting on a line of investigation in relation to our high school penmanship. The study here yesterday showed that the quality of high school penmanship falls down; the speed increases, but the quality falls down. Now we are going to use the Ayers scale for adult penmanship, and we are going to try to establish a standard for our written work, and I am going to give each teacher a copy of that Ayers scale so that we can keep our writing up to a certain standard. We are also experimenting with supervised study with the algebra tests. Of course we were in on the unit costs, and we will use those, of course, for the administration and supervision of schools the same as the other schools have used them.

MR. CUBBERLEY: Mr. Neighbors, of Wabash.

MR. NEIGHBORS: I am not a person who has done a great deal of work with the tests, altho I have done some experimental work in other lines.

MR. CUBBERLEY: Tell how you have used them with the teachers.

MR. NEIGHBORS: I haven't used them myself, but my predecessor, who left Wabash about two months ago, did. I couldn't tell how he used them, but the conclusions have been that these tests emphasized more or less certain danger signals, or set up certain guide posts. You can't always draw certain definite conclusions after having given tests, but you can always tell that here is a condition which needs investigation, and I know that that at least was his policy, and, from the little experience I have had, has been mine.

Mr. Horton suggested one thing I should like to mention, altho it may be just a little off the subject. It emphasizes the general idea. In the matter of the curve of distribution of grades, we had some occasion to make some experiments several years ago and we found that our curve was decidedly skewed in favor of the eighth grade, a grade which happened to mark the particular point of exemption in our high school in this year. We did away with the whole exemption system, and at the end of the first term I made another curve of distribution for the grades in the high school, and found that that curve behaved in a perfectly normal way, with no skewing at all in favor of the eighth grade, which might argue that the teachers had been somewhat influenced by the fact that, when they got near to the decision point, not knowing exactly what to do, they gave the pupil the benefit of the doubt and skewed the curve in favor of the exemption grade. It meant for us at that time that, if this curve was skewed in the direction of that particular grade, this was the cause of it, and it seems to me that is the whole point of tests of this sort. Here is something that needs investigating, and let's see what the cause is.

MR. CUBBERLEY: Has someone else some contribution to make?

MR. GILES (of Richmond): Mr. Chairman, most of us do not have a single officer in the force who can give the test thruout the system, and if we do not have that difficulty, one of the biggest difficulties then is to get the test given under uniform conditions. For instance, in giving the spelling test it was given by the principals of our buildings, and whereas our median was along about 70, where it ought to be in most buildings, in one building the median was up in 90, and that was the building that had the lowest median in every other test that we gave. Now that meant something was wrong, you see. There is a very great temptation to get ahead of the game, somehow.

The remedy that we have at Richmond for that you may not all be able to use. We have all of our pupils in a junior high school, and in giving the Courtis test a few weeks ago we gave it simply to the seventh and eighth grade pupils. It was given by the teachers in the junior high school, and instead of simply writing on their papers the "Garfield school", they wrote the school that they came from, and I used it as a check on the supervision of our ward schools for the first six grades in arithmetic. You see there couldn't be any objection to that. It was turned over to the principals to find out why their score happened to be low or high. Now just one other point.

We are using the Jones vocabulary list in primary reading. The principals are, together with the kindergarten teachers, giving that in the primary grades, the 1-A, 2-B, 2-A, and 3-B. The purpose of that is to test out our method of reading. We have a variety of methods. Some teachers are using pretty largely the Ward; some the Rockford and the reading literature; some the Aldine; some the Beatty. There are quite a variety of methods being used by our primary teachers, and we are giving this Jones vocabulary test in order to get some check, if possible, on our methods of primary reading.

MR. CUBBERLEY: Mr. Childs.

MR. CHILDS (of Indiana University): I wish to make one statement. I suppose there are in Indiana, in spite of the fact that Indiana has excellent superintendents in this movement, a few possibly who test just for the sake of testing, but they soon quit that because there is too much work connected with it.

Within the last four weeks I have had four or five requests from principals and superintendents out in the State, writing in here for data that we have collected in some of these studies, stating definitely that they wished them for the purpose of bringing about certain reorganizations in their work on which they felt that information would be valuable. I am glad some of the superintendents and principals are finding some value in some of these things, and are making use of them.

MR. CUBBERLEY: I think the contributions which have been made so far indicate rather clearly how we may use these tests. There are many ways. Perhaps I might close this discussion by telling you some that I have come in contact with myself, which will also reveal usefulnesses somewhat along the line of those which have been mentioned.

One of the most interesting studies, I think, that I have ever been engaged in was the survey of the school system of Butte, Mont. There may be less promising places in the United States than Butte, but I have never seen them. Something like 80,000 people are collected there on the hillsides; the whole town undermined with copper shafts and tunnels; saloons everywhere; everything run as a wide-open town. It is a place where almost nothing green grows, the smelters having killed almost everything. To have lawns the dirt must be brought in from the outside. There are a few bushes and a few trees seven or eight feet high in town, but that is about all. The children know almost nothing of nature, or of proper home life, because the schools were doing almost nothing to teach them these things. There was, at the time we tested the work, no domestic science in the grades, and only a little poor manual training. Everything concentrated on the formal book subjects. The conception of the school seemed to be to get a room, a stove, and a teacher, and have the pupils get their books and come and learn what they contained.

Now you can readily imagine that a school system such as I have described, when tested, would test up rather high along purely formal lines, and would test low along lines which involved reasoning, and that is exactly what we found. All of the evidence from the tests pointed to a school system emphasizing memory work as the chief end of the educative process. The pupils ranked high in spelling; and high in addition, subtraction, multiplication, division; but very low in composition, and in the reasoning tests of arithmetic. The children showed up poorly in all reasoning tests; nothing in the school system emphasized that side. I don't know of a place where tests have been made where the character of the school system tested has stood out so clearly as did the schools of Butte; what was needed there was a radical reorganization of the school system. If the superintendent of schools was hampered by his board of education, then the board of education needed to stop interfering with the schools. If the superintendent was not hampered and could go ahead, then what they manifestly needed was a new superintendent of schools. That that school system needed reorganization from top to bottom was clearly shown.

Turning to Salt Lake City, I can cite another very good example, but of a very different type. The schools there as wholes showed up well in all of the tests, but whenever we began to analyze differences between grades in different buildings we found quite marked extremes. Here was one building which was uniformly high in almost everything; there another building which would run uniformly low in almost everything. The natural question that ought to be asked of the principals is how they could explain such large differences. Wherever we tabulated single rooms or grades we found the differences among the children within the grades were even more marked than the differences between buildings. The report tried to call the attention of the school authorities to this condition, and to say that what the school system had done for the mass it ought to set itself seriously to try to do for individuals,—what the school system had accomplished so well up to now for the average child, it needed to set itself to do for the individual child. For example, in spelling, 40 per cent of the children weren't tested by the test at all. That is, 40 per cent of the children made 100—they spelled everything they were given, and therefore they were not really tested. When we found, in say a sixth-grade room, from 25 to 30 per cent of the children making 100, and perhaps 15 to 20 per cent of the children not coming up to a fourth-grade average, the natural question to the supervisor is, why these differences?

Again, a retardation sheet taken for an entire school system, or for any building in the school system, would show similar results. In the city of Portland, for example, where I directed a survey in 1913, a retardation sheet there showed conditions that were very surprising to the school principals. Statistics published in the annual school report showed that there were over 1,500 children over 15 years of age in the elementary schools. When we asked the building principals to give us an age-and-grade distribution sheet for their building, and we showed them the charted results, many were greatly surprised to find that in some of the best schools and some of the best residential sections of the city the retardation would run 20, 25, and 30 per cent. This illustrates how a retardation sheet may be used as a means of supervision.

The Butte study showed clearly the need of a reorganization of the school system. In Salt Lake City, where average conditions were very good and a good piece of constructive work on the part of the superintendent of schools was revealed, the need of a more individual study of conditions was shown. The study of the Salt Lake City schools was certainly as fine a vindication of a superintendent's work as anything which has appeared in print in the line of survey work, and yet it pointed out individual differences in every school in that city that were rather alarming when viewed from the standpoint of the interests of the children. They were dealing too much with the needs of the so-called "average child."

Have we not been using entirely too much "average", or mass results? It is only recently, as you and I well know, that we have begun to pay some attention to the child of defective mentality, or the child with physical defects. We are beginning to segregate the retarded child, the child who is crippled, the child who is of a low-grade mentality, or who is anemic, or tubercular, and are beginning to provide educational advantages for such suited to their rate of running. The most useful child in the school system, tho, is the child who is above average ability and who too often today is fooling along and dawdling along because he or she is never given work which is up to capacity. They represent what we call the "gifted" children, and they, from the standpoint of democracy, are the hope of our country. And yet we have as yet done almost nothing for such in our school systems, and it may be some time before we will be able to give them the additional advantages they deserve. Too often we are unwilling to recognize the existence of such children in our schools.

A great many people will tell you that such advantages can't be arranged satisfactorily. We have recent experiments which prove the contrary. Here is one. At Montclair, N.J., a few years ago, they organized a class of sixth-grade children from among those who were better than the average fifth-grade child. This class they put thru the sixth, seventh, and eighth grades, in two years, which can easily be done with selected children. The instructions to the teacher were not to push them, but to give them work which was up to their ability. When they had finished the eighth grade this class was tested in comparison with children who had taken the full three years. They measured higher than the children who had taken the longer time. They had not been injured by the process, while democracy had gained a clear year in the training of those youngsters and in getting them into their life work. More than that, instead of staying in the school and dawdling along and learning habits of loafing, they had been learning habits of work.

I am thoroly convinced that a great many college boys who come to us and loaf their way thru college have learned to loaf down in the grades, because they have been brighter and have had better home conditions, have had a better economic background to ensure the better home conditions, and are often better in mental capacity, but they have never been worked up to capacity in school. Instead they have learned to slide along; to loaf on the job and bluff thru; and they come to college and bluff and loaf thru and go out into life as bluffers and loafers. They may, due to superior ability, do fairly good work, but they never realize their possibilities at all.

Again, we might use these tests in supervision in other ways. Suppose we take the test one year, and the next year and for a number of years in succession make the same kind of a test, in the meantime calling attention to where we are standing, actually and comparatively. Here is where we stand in the Courtis tests; here is where we stand in reasoning tests; here is where we stand on a Buckingham or an Ayers spelling scale; here is where we stand on a Thorndike, Ayers, or Freeman writing scale. Now, where are we? Where are we going? Was our work better in 1916 or 1915 than in 1914 or 1913? Are we making steady and consistent progress, or are we holding our own? Such are perfectly legitimate questions of supervision which these tests can answer.

The one that Miss Kerr gave is a very good one. After you have coached up your children in arithmetic, do they hold the training, and especially do they hold it over summer vacation? This is a perfectly legitimate question to ask, and if you find that they do hold it, you have a good deal of reason for congratulation.

Take your spelling in the same way, or your geography. I am convinced that a great many of the facts we teach in geography are of no particular value. Well, how are we going to prove it? That is my opinion. You don't agree with me. Well and good; then so far it is only a matter of personal opinion, and the only way in which we will be able to settle the question will be to make up some tests which will test the efficiency of this instruction from the standpoint of its ability to stick or its usefulness for life work.

We can also test the instruction from the standpoint of usefulness. Take domestic science, for example. We have had much discussion recently as to how best to teach domestic science. Should we teach it in the old formal way of beginning to learn how to light a stove, and then how to cook an egg, and bake a loaf of bread, and a cake, and so on; or should we take up the Gary idea, where the girls go in and help run the cafeteria and out of that learn their domestic science?

We will never settle such questions by argument. The old-fashioned domestic science teacher says that the Gary system is mere child labor. The Gary man says it is good teaching. One opinion is perhaps worth just about as much as the other. Can we not evolve some tests for testing the things which domestic science is supposed to teach, such as the development of the practical judgment of the girl and the giving her an insight into life's problems, so that she can use her head, in addition to knowing how to cook and bake and take care of a kitchen?

Now with some such tests as these we might measure up a number of Gary systems with a number of systems using the other plan, and see where they stand. It is possible, by means of tests of this kind, to keep questioning all the time the efficiency of your instruction and the effectiveness of your supervision. Let me give you an illustration, which Bobbitt gives in one of the reports of the National Society for the Study of Education. He mentions the Union Pacific railroad, which maintains a bureau of efficiency. Some new process is evolved, or some new thing is to be done, and a half-dozen different ways of doing it are soon evolved. At first they are all permitted, but the tests at the end of a year or two show conclusively that two of the ways are very much better than the others; then the other four are taken out, and one of the two approved ways is prescribed. If the tests continue to show that either one of the two gives about the same results the two are allowed to be used, but if, after discarding the others, one of the two comes clearly to the front as the better, then that one becomes the standard method for the Union Pacific railroad. In so far as two methods will give approximately equal results the two are allowed, because they allow for differences in individuals that it is well worth while to preserve.

We are today in the matter of grade instruction *vs.* departmental work for the upper part of the elementary school course in much the position of the Union Pacific railroad when it allows either of two methods to be used, but we may come to the time when the present eight years of graded work may be interdicted as not giving the best results for the children.

The large point I want to leave with you is that there is a whole series of problems which a superintendent can keep putting up to himself, and to his principals and teachers in turn which involve a test or a measurement to find any answer that is really an answer.

Measurements Applied to School Financing

ELLWOOD P. CUBBERLEY

WE are everywhere over the United States facing the question of increased money for schools, and almost everywhere superintendents and boards of education are looking about trying to find what they can do with the problem they are facing. Public education is essentially the process of spending more money in a better way, and each improvement in the matter of education which we make is almost inevitably something which costs more money.

If we want a cheap school system the way to do it, of course, is to make the schools as poor as is possible. If you get very cheap teachers; if you have very poor buildings; if you supply poor and an inadequate quantity of school supplies; if you don't do anything whatever to enforce compulsory attendance; if you let as many children as possible go to private schools; and if you don't develop night schools, or any vacation schools, or any vocational schools, you can perhaps cut the number of children who attend the public schools to less than 50 per cent of the total number, and you can also make it so that the cost per pupil each year will be small.

There are some school systems in the United States that would almost seem to be run on that basis. They have their school system very cheaply managed; they employ home girls as teachers, and at the lowest possible market rates; they supply just as little equipment as is possible; and their education is very largely book instruction. The main things they need are a room, some seats, a stove, and a teacher; the pupils learn what is set down in the books. The course of study frequently says: "Begin at page 42 and go to page 82, and stop."

Such a school system is not only exceedingly cheap, but it requires little forethought as well. Whenever such cities begin to employ superintendents who come to conferences for educational measurements; who get to studying the amount of waste products in their schools and how they may utilize this waste product and get better results; who seek to introduce new and specialized pieces of machinery, as it were, in the manufacture of young people, so that they can turn out a larger percentage of efficient men and women, and have a smaller percentage of waste; and who begin to ask for better teachers and better teaching equipment, each one of which costs money, the costs for education begin to increase rapidly.

There was a time, 10, 15, or in some places 20 years ago, when it wasn't a difficult matter to get more money for the public schools. The school authorities asked for it, and if it seemed at all feasible got it from the town council. That day, I think, has passed forever, and we shall have clearly to prove our needs for nearly all the money we get from now on. We shall have to show that we have equal or greater needs, as I think I said last night, than has the bureau of health, or the bureau of milk supply, or the bureau looking after infant mortality, or the sewer department, or the street department, or the park department, or the police department,—all of which are now in the struggle for city funds, and this presents a rather hard problem.

Education is, in a sense, a surplus luxury. You are, in a sense, doing something for the next generation, which is wholly different from work in which you can demonstrate that you are going to get your money back at an early date. The tax-paying generation is never paid back for educational work. About the only way in which one can ever render repayment for the service which has been rendered to him is to render it, in turn, to the next generation. We are continually working to make a new citizenship, and all the money we put into education is, from a certain point of view, a waste of funds. We have to look at it from the larger point of view of city interests, State interests, and national interests, to become enthusiastic about levying taxes on ourselves to educate someone else's children, and especially to educate them along higher and highly differentiated lines of training. The problem of increasing need for funds for education, and an increasing pressure for funds from all other city departments, is one which we as school officers will have to face from now on. If you happen to be fortunate enough to be in a State where the city council hasn't anything to do with it, and where the school board can, by State law or city charter, levy their own funds, up to a certain limit, you have very decided advantages. I have been contending for some years that that is the rational scheme; that we ought to have it arranged in that way; that there ought to be guaranteed in the city charter, or better still, in the State law, a definite number of mills that may be levied by the board of education on its own judgment, without ever asking the permission of the city council. If a still larger school levy is needed the question should be submitted to the people of the city for a vote, and not to the city council, and for the very important reason that the schools seem to me to be not a part of the city government, in the sense that the patronage departments are, but rather to stand coördinate with the church and the home for the improvement of the race and for doing things for the next generation. Such an institution we can hardly expect an ordinary town council to be enthusiastic about.

In a few of our States this has been done, and in many of these States, within the last few years, there has been an effort on the part of mayors, town councilmen, and politicians to break down such a State law or charter provision. In Kansas, in particular, there was quite a movement made by the mayors last year to bring the schools under the city government, to unify the city tax-rate, they said. To unify it, to be sure, but is there any reason why it should be unified?

New York State, recognizing health as a valuable asset, created a State health council and gave it large independent powers. It is almost a legislature in itself. The State did this simply because it was felt that the public health was too important to be left to the State legislature or to the town councils, or even to town boards of health to control. The State deemed it a matter of such vital importance, and one which looked so to the future, that it ought to be organized separately and by itself, and with large powers of its own. Accordingly, this State health council has power to nullify a local health ordinance and to institute a State-wide ordinance, if it sees fit to do so.

So, in a way, the schools are of enough importance, are coördinate enough with the home and the church and look enough to the future, that we ought to try to keep such legislation in States where we have it, and in the reorganization of city school systems with new charters or State school systems with new laws, we ought to try to get provisions inserted in these which will give to school boards the power to levy certain amounts of money for maintenance, and certain amounts for buildings and repairs, and without any regard to approval by the city council. For further amounts the matter should be submitted to a vote of the people, rather than to a vote of the city council.

In many places, tho, this cannot be done, and we shall have to continue to go to the council and prove our needs. Probably we shall have to ask for what we want, and take what we can get. In many of our cities we are today, as a result of such a process, having a serious struggle to maintain the schools in the way in which they ought to be maintained.

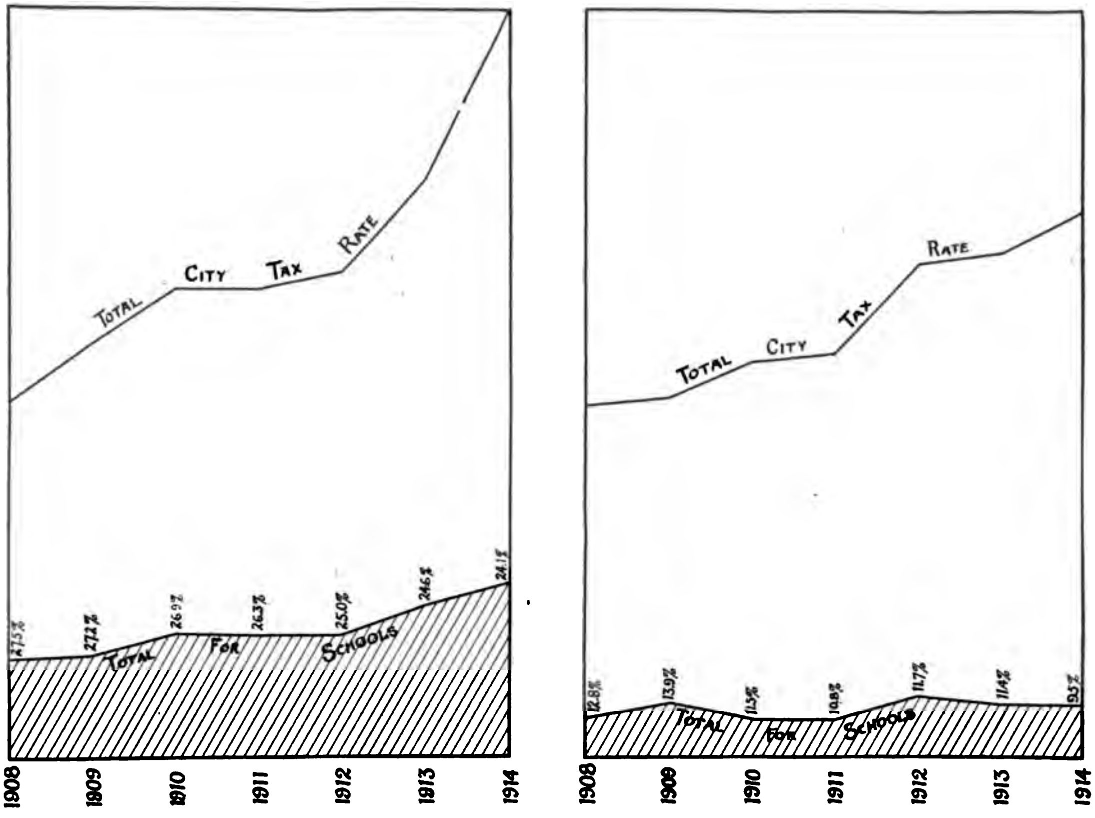

FIG. I. SHOWING THE COMPETITION FOR CITY FUNDS (Schenectady, N. Y., and San Francisco, Cal.)*.

In both cities the school board has nothing to do with the fixing of the tax-rate for schools, and in each the schools have been completely outdistanced in the race for funds by other city departments. Many other cities will show a similar situation.

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*From Professor Cubberley's *Public School Administration.* Houghton Mifflin Company, Boston, 1916. Reproduced by permission.

I have a couple of drawings here. They illustrate well the problem which faces two cities where the city council has complete control of the school tax-rate. This one shows conditions in the city of San Francisco. The upper line represents the total tax-rate as it has increased from 1908 to 1914; the lower one represents what the schools got out of it, and you can easily see from the drawing that the schools have been losing continually. Then I have the percentages across the line showing what percentage of the total city tax-rate has gone for schools, and these show that it has decreased from 13.9 per cent. to 9.5 per cent.

The next one is the city of Schenectady, N.Y., which illustrates the same process. The upper one is the total city tax-rate, and you see it has been aeroplaning, but when you look at the school tax-rate it hasn't gone up so fast. It has decreased from 27.5 to 24.1 per cent. It has actually lost in percentage of the total, tho it has done better than San Francisco—increased somewhat actually. San Francisco's amount for schools has actually gone downward.

These two cities illustrate conditions in dozens of other cities where the city control of the school tax-rate prevails. The school board goes before the town council and asks for what it needs. The town council, tho, often isn't interested in things which look so far to the future. It is interested primarily in the patronage departments, and the great patronage departments are parks, streets, police, fire, and sewer. These are very desirable things to have, no doubt, but as Mayor Low once said, in New York, what is the use of having parks and streets if we don't have schools? Schools must come first.

In the process of trying to prove your needs I think we school men must come to a new kind of bookkeeping. Last summer I was employed by the city of Oakland, Cal., to do a little piece of work, which was a very interesting one to me. The city of Oakland has been, for some time, developing its municipal undertakings at a very rapid rate. They built a city hall, first planned to cost $1,000,000, but they found this entirely inadequate, and finally spent $2,000,000 on it. They started to build a municipal auditorium at a cost of $500,000, but when they got it finished they found that it had cost them $1,000,000. They have started on a wonderful plan for the development of city docks. They have fine streets, and a great many parks and drives, all of which are very nice. They have been building very expensive schoolhouses, many of them low, rambling, one-story structures, which are very attractive but at the same time very costly. The result has been that tax-rates have jumped to such a rate, to meet interest on the bonded indebtedness, to care for the new improvements, and to meet the upkeep of these new undertakings, that the people last year elected a new administration pledged materially to cut down the tax-rate, and these men went in with the understanding that if they were elected they would make a very substantial cut.

The school department, which is in part independent of the council, but in some features has to go to the council for additional funds, employed me to come up and pass on three things: First, was the school system organized so as to get the most efficient results? Second, was the scope of the school system too large, or not large enough, or was the development poorly balanced? Third, was it costing as much as it ought to cost, too much, or about right? The report which I wrote for them was published in a little document of forty-eight pages, and is sold by the board of education for a dime.

I took 16 western cities where tax-rates were comparable, where all costs for city expenses were comparable, and I showed them, by the comparative method, that their city school system was below the median compared with other western school systems. I showed them that they were not only running on a lower overhead cost, but on a lower percentage for supervision and administration; that they had a larger number of children per teacher than other western cities; and that in almost every feature of the administrative organization they were below the median. That being the case, they could hardly be accused of extravagance.

In analyzing the scope of their system I showed them that their great trouble had been, as far as education was concerned, that up to relatively recently they had maintained merely a traditional school system, with only the elementary schools and a high school. During recent years they have developed a good modern school system, with kindergartens; intermediate, technical, and vocational schools; playgrounds; good athletic work; school orchestras; and other educational advantages. The result has naturally been that with the increasing scope and effectiveness of the education provided there has been a marked increase in its cost.

Another good illustration which I can give you is the city of Salt Lake, in Utah. They had an interesting problem there.

They had an idea that their schools were costing them a great deal of money, and they particularly pointed to the fact that practically 40 per cent of all city taxes went for education, and that they were spending $6.71 per capita for schools, whereas many other communities were spending $4, $4.50, or $5. On the face of it, it looked rather bad. A percentage of 40 per cent of all tax-rates for schools is large; a tax of $6.71 per capita is also rather large. Such would exceed not only most eastern cities, but most western cities as well.

I had a feeling, however, after I had looked at their schools for a week, that there was something wrong in the figures; there was some element which had not been taken into consideration. Their teachers were paid but a small amount; 15 per cent of their teachers were working for less than $520; and they were not spending money freely anywhere that I could see. Their classes were gradually being increased in size, and were then up to an average per teacher of 43 children. I couldn't understand how they were spending any such amount of money, and yet the books seemed to show it. When I analyzed the situation, here is what I found. It is a type of business analysis which every superintendent ought to make. They were actually spending $6.71 per capita for schools; the average for 16 western cities was only $6.27; the median for 16 western cities was only $5.73; 39.1 cents of every dollar raised by taxes in the city went for the maintenance of the schools. In the matter of expenditure the lowest western city was San Francisco, spending $4.27 per capita, and the highest was Pasadena, which has an extraordinarily expensive school system at $10.11.

Let me take it another way. San Francisco was spending 11.9 per cent of its total money for schools for the year that I took; Pasadena was spending 43.3 per cent; the average for the western group was 32.2 per cent; the median was 31.8, and Salt Lake City was spending 39.1. I then hit upon the clue to the whole affair.

I began to investigate how many children there were in Salt Lake City, compared with other western cities. Western cities ordinarily do not have very many children. The average for the entire United States is 17.3 per cent of the population between the ages of 5 and 15 years; the average for the ordinary western city will run about 12 or 13 per cent, because we have so many unmarried men between the ages of 25 and 45,—young fellows who have come west and have not as yet developed a family. The result is that the number of children to be handled in any western city is not very large. San Francisco, for example, has 11.9 per cent; . Portland, Ore., 12 per cent; Sacramento, 12 per cent; Seattle, 12.5 per cent; and so I could run down thru the western cities, and none of them has 15 per cent until I strike Salt Lake City, which has 18.5 per cent. There is the whole explanation. With Portland at 12 per cent, Salt Lake City, to provide merely equivalent schools with 18.5 per cent, must spend a little over 50 per cent more money, and compared with San Francisco at 11.9 per cent, they must still spend a trifle more money.

I then began to try to reduce this back to simple terms. What are they spending for each 1 per cent of the total school population? That makes a very much better statement, and when I got at it that way, Salt Lake City was spending 36 cents for each 1 per cent of the total population; the lowest of the entire list was Tacoma, at 32 cents; the highest was Pasadena at 74 cents; the median for the western cities was 43 cents; and the average was 45 cents. With Salt Lake City at 35 cents and the median 43 cents, you have the deficit at once of 7 cents for every child, compared with just the median, and we all know that the median represents merely average conditions. It means, in other words, there are as many school systems spending more as there are school systems spending less.

Taking Salt Lake City with 18.5 per cent of the population, it is spending $6.71. Figured out on the 1 per cent basis, and the median of 43 cents as a desirable expenditure, it should be spending not $6.71 per capita but $7.96, or a deficit of $1.25 per capita of the total population. In other words, multiplied out, it would require at once an increase in the school expenditures of $137,500 merely to bring the schools of Salt Lake City up to the median condition for western cities. You can easily see the situation.

I then proceeded to make up a chart which would show, in picture form, what rate of tax on the $100 of property Salt Lake City would need to raise to provide the same kind of schools as are today provided, provided it had the same percentage of children as the other western cities. If it had the same percentage of children as San Francisco, for example, it would need to raise only 30.4 cents; if it has as many as Spokane, it should raise 37 cents; if it has as many as Los Angeles, 33.2; as many as Fall River, Mass., 52.2. Salt Lake City's position was 47.3.

The position of Salt Lake City is easily shown with reference to the question of children. If you want a large family, all right; but don't then complain because it costs something to educate them. If a city wants families of 5, 6, 7, and 8 children, all very well, but it must not expect to get off on the same kind of a tax-rate for schools that a city of small families does. Such western cities as Portland, Los Angeles, and San Francisco can naturally maintain their schools for 50 per cent less money than can the city of Salt Lake; or, to put it in another way, on the same amount of money they can pay 50 per cent better salaries and maintain a 50 per cent better school system.

Then I took up the question of what they needed to levy to maintain properly their schools, and pointed out that they needed to raise, at once, something like $140,000 more money to bring their schools up merely to the median. If they wanted to provide adequately for their schools they would need to quit entirely thinking in terms of how much per dollar they were spending, compared with other cities, and to substitute how much they were spending for each 1 per cent of the school population. In the superintendent's report there should be no further mention of per capita cost, but instead, how much the schools are costing for each 1 per cent of the children to be educated. An earnest effort should be made to get the people to see the need of bringing their expenses up to at least the median of western cities in the matter of each 1 per cent of the population.

The illustrations I have given you will reveal the kind of study which can well be made in a community where there are a large number of children to be educated, and where people are continually quoting to you how much cheaper per capita some other community is educating its children and conducting its schools. You must think in terms of each unit of your school population.

Let me turn now to another phase of business administration which I think we also will have to face, and that is the question of unit costs. What is it costing not only for each 1 per cent of our population, but what is it costing for each unit of everything else that we have or use? A very significant study has recently been made by the director of the Efficiency Bureau of Kansas City, Dr. Melcher, published in the fifteenth "Yearbook of the National Society for the Study of Education". Mr. Melcher shows how he went into the question of fuel cost, heating cost, building cost, and somewhat into study cost. A still more interesting report, in some respects, is that which has just been published on the "Organization and Administration of the School

City of Denver", by Dr. Bobbitt, in which he analyzes instruction cost and supply cost for the city of Denver in terms of units.

Dr. Melcher found, in his study of fuel conditions, that Kansas City showed these results. First, he took 50 of the largest cities of the United States. Of course different climatic conditions will modify fuel costs, but such ran from 37 cents to $2.70 per pupil per year for fuel. The median was $1.325. Kansas City showed a variation of from 73 cents to $4.60, with a median at $1.62. He then took Kansas-Missouri-Iowa cities, which ran from 70 cents to $2.09, and the median was found to be $1.55. The costs in Kansas City may be perfectly explainable. There may be nothing the matter with them, but they present, nevertheless, a question mark that the efficiency expert of Kansas City is looking after.

He then turned to Kansas City alone and took up the different buildings and different kinds. Thirty-one of these were using oil fuel; 33 buildings were using soft coal; and 18 buildings were using anthracite. The oil was costing from 99 cents to $4.08, with a median of $1.35; soft coal was costing from 73 cents to $4.90, with a median of $1.83; and anthracite was costing from 96 cents to $4.56, with a median of $1.92. Now there isn't a great deal of difference between the minima and the maxima, but there is a big difference between the medians and the maxima. It is a perfectly legitimate question to ask in Kansas City, Are all buildings properly heated? Are some buildings not too hot? It is also a perfectly legitimate question to ask, Are not some of these buildings pretty poorly constructed, not only letting in a lot of cold air, but perhaps having too high ceilings? Are the janitors watching the schoolroom temperatures? Are the teachers watching them? As Dr. Melcher points out, it is very probable that if this study were followed up, and the janitors were given instructions in firing and temperature rating, they could save $10,000 a year on their fuel bill. If so, that would pay for their efficiency bureau about three times over.

Another question which he took up there is how much it cost for each thousand cubic feet of air that is heated. Other conditions will now come in, such as how much night work is carried in on these buildings? How much are they used as community centers? We ought in time to evolve some standards by which such questions may be answered.

Turning now to the Denver study, I want to consider briefly another type of cost questions, those relating to instruction.

Professor Childs gave you some statistics of this type this morning. In Denver, figures were collected to show what it cost for 1,000 hours of instruction in the different subjects in the different high schools of the city. In the West Side high school it cost $1.32 for 1,000 hours; in the East Side high school, 93 cents; in the South Side high school, 87 cents; in the East Eleventh school, 82.7 cents; in the Manual Training high school, 93 cents· and in the North Side high school, 62 cents.

These figures raise a number of interesting questions. Taking the West Side high school, why is the cost so high, unless this school has a particularly small number of children per class, or is as yet an undeveloped school? Some reason ought to be sought as to why instruction costs run high there. There is also a similar question as to why instruction costs in the North Side high school run so low. It may be that this is inadequately provided with teachers, or that this school may even be too expensive to retain.

Turning to the cost of instruction per student hour for the different subjects, Dr. Bobbitt found these: English, from $53 to $65 per 1,000 hours; mathematics, from $57 to $79; history, from $46 to $73; modern languages, from $72 to $93; science, from $43 to $86; drawing, from $50 to $107; and Greek, which was offered in but one high school, was costing $322 per 1,000 hours. When we look at these figures the wide variations in costs naturally raise questions. Perhaps history in some high schools is taught too cheaply; perhaps they should have better equipment, more library books, and perhaps reduce the size of the classes by putting in more history teachers. It may be that the modern languages are taught in too small sections. It may be that you can't help this. Science, which we expect to be expensive because of laboratories and smaller sections, is not expensive at all; under these conditions, apparently, Denver could push science instruction in high schools without any great cost. Drawing runs up a little but is not particularly high. Greek is the expensive luxury. It may be that they can afford it, but it may be, on the other hand, that Greek is provided at the expense of other things in the system which are more vital. There is no basis for throwing Greek out on its high cost, but there is a pretty serious basis for asking Greek to stand up and prove worthy to remain.

Again, in pupil supplies, Dr. Bobbitt found that the cost of supplies varied from 6 to 25 cents per year for pupils' supplies, a median of 12 cents; textbooks from 23 cents to 83 cents; with a median of 47 cents; and supplies used by the teachers in instruction varied from 13 cents to 24 cents, with a median of 16 cents. From such figures it is a very serious question if all of these schools are not being undersupplied. When Dr. Bobbitt correlated these figures with the retardation sheet for each school, he found the most serious cases of retardation accompanied the lowest expenditure for supplies. Instead of being economical, such economy is frightfully expensive. It means unduly increasing the repeaters. Of course you may say that the farther down in the grades you keep the children the cheaper it is; if you get them along they only get into high school and cost you more money; that the cheapest grade teachers you have are third and fourth grade teachers, so keep the children there as long as you can. If you follow this argument out the logical thing to do would be to abandon the public schools entirely, and turn the children over to private and parochial schools to be taught. But we didn't start our schools on that basis, and we aren't working on that basis, and if you look at the question from any point of efficiency, then the teaching of repeaters is a frightfully expensive piece of work. As citizens and tax-payers we have the right to grumble pretty seriously at the school board or the superintendent who allows such conditions to go on.

It may be that in some schools we are spending too much, and that possibly some economies could be made in some places. On the other hand, it may be that the whole expenditure is too low, and that everything along the line should be raised.

Coming back to what I said in the beginning, the process of education is primarily the business of spending more money in a better way, and there is no other way to make good schools. You must get at the process of spending your money so as to make both sides of your dollar count, and get the maximum results for the money you are putting in. At the same time, you must work to get more dollars to spend to increase the value of your output.

You will never be able to prove your needs to "the man in the street", or to the man on the council, until you can show him, in some terms that he can understand, that you are getting value received for the dollars he gives you. If you tell him you are producing men and women, that you are doing wonderful work for the citizenship of our republic, and that you are turning out young people instilled with the highest ideals, he may believe you, but he might with propriety very seriously question whether you know what you are talking about.

But if you can prove to him that you are getting good instruction along certain lines; that you have averaged up the cost so that you haven't any big extremes; that if you had some more dollars, a certain added percentage to put on your funds, you could do so much more with it, then you have some basis on which to talk. Generally what happens is this: The school budget sent up to a city council asks for, say $73,000 more than costs had last year, but with no clear statement of why you need this amount; no statement of added needs; no statement as to unit costs from which added expenditures have been calculated; and little upon which a councilman can estimate the business efficiency of a school system.

It is something of this type of accounting that you will have to face in your business relations. In your State of Indiana, for example, very few of your cities publish an annual report at all, and I think one reason why the superintendent's pay in Indiana is lower than it is in adjoining States, one reason why you have more difficulty in getting money for your teachers' salaries, one reason why you have difficulty in getting more money for expansions, is that you don't tell the people what you are doing and of your needs by publishing an annual report. Once each year you should render in print an account of your stewardship; as manager of the business you should report to your board of directors, and thru them to the stockholders of the corporation, telling them what you have done with the money they gave you last year, and how much more you could do if they would give you more next year. Only on some such basis can we safely face the question of increasing cost, the question of higher interest rates, the question of the greater struggle for city funds. Unless this question of finance is faced intelligently and in a truly businesslike manner, I think many superintendents of schools are headed for trouble.

Principles of Scale Derivation with Special Application to Arithmetic, Geography, History, and Grammar

Bruce R. Buckingham, Educational Statistician for the State of Wisconsin

The subject of the report which I bring to you this morning is a rather ambiguous one. We all know that at a certain point in any development there comes along a theory to justify the cruder practice which has hitherto characterized it. It has seemed to me that there is emerging a theory in the matter of scale derivation, and that if we can apply it we shall be able to derive scales of much greater richness and compass, and in much greater numbers than we have been able to derive them hitherto.

Not long after I became connected with the superintendent's office at New York, I was asked to undertake an investigation of the academic teaching in the fundamental subjects in different types of elementary schools. The opportunity which this offered of putting into practice the application of experimental methods to the elucidation of particular educational problems made the project seem to me very attractive. The subjects in which it was decided to test the children were arithmetic, spelling, geography, history, and English grammar. The seventh and eighth grades of sixteen schools were examined on March 13 and 14, 1915. On June 15 and 16, 1915, they were again tested in the same subjects with material which was designed to be of the same difficulty as that of the material used in March.

I take it that any testing which is carried out upon a scientific basis must be composed of three rather definitely fixed lines of activity. There must be a preliminary test, when material is evaluated, conditions are estimated, and the general attitude of the experimenter and the subject is determined. Ordinarily the material derived from this preliminary test will not be used. Then there is the real test, the one for which the preliminary test was a preparation. This constitutes the basis of the report. The answer to the question is derived from it. And, thirdly, there is the control test whereby conditions are set over against conditions in such a way that comparison is possible.

Now in the testing of these schools in New York City the preliminary test was occupied with an evaluation of the material to be used. The particular object was to obtain a certain parallelism of the tests. For the purpose that I had in mind a progress record between March and June could not be obtained unless we could use material the difficulty of which was known and preferably known to be of equal difficulty. Accordingly, a large number of questions was used in an attempt to evaluate material for these different school subjects. The real test consisted of the application of a selection from these questions to the experimental schools in New York, of which there were 8; and the control test was represented by the administering of the same test material to 8 other schools pursuing the regular course of study.

The number of participants in the real test was about ten thousand both in March and in June, and the number of participants in the preliminary test differed greatly for different kinds of material. I am not giving you any report here for the preliminary test, nor am I giving you any report of the spelling test. Ten questions were given in arithmetic in March and 10 in June. You will find those 10 questions in March on the first page of the material* you have in your hands, and the ten problems for the June test are on the second page. In geography there were 40 questions given in the real test. These occupy pages 3 and 4. In history there were 24 questions; and in English there were 28, except for the fact that in the first half of the seventh grade only 20 questions were given.

At this point permit me to digress momentarily to say that there a great many situations similar to the one which I am here reporting. Tests are no new things and I fancy that in looking at these questions they will appear to you to be not greatly different from the tests which you have been familiar with as teachers and supervisors. They are instruments that have been used by teachers and supervisors time out of mind. Every year, in most places every half-year, and in many instances more frequently, children are tested in a number of subjects with the idea of finding out how they are maintaining themselves or whether they ought to be promoted or not. The particular and temporary need having been served, the material and the results have reached the waste basket. It is no doubt true that if the material which is so disposed of in a single week in our schools could be gathered together it would make the most important contribution to education that could be devised. Effort without knowledge of results, blind, wasteful, trial-and-error methods mark the progress of the young teacher who faces problems unaided, because thousands of people who have solved them before her have not thought it worth while to save their results.

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*For material referred to see Appendix.

To turn to the tests as they were given in New York. More than 20,000 returns were received in the March and June tests taken together in each subject, or 100,000 papers in all. This involved the examination of 200,000 answers in arithmetic, 400,000 in geography, 240,000 in history, 280,000 in grammar, and 1,000,000 words in spelling. It is from this material that I propose to offer today scales for measuring attainment in each of the subjects except spelling, as far as the relatively small number of questions permits this to be done.

At the outset permit me to state the way in which the questions were selected. A previous study of spelling gave a hint as to method. In the rating of spelling, each form is either right or wrong, and it has never been customary to allow part credits for words only slightly misspelled. It occurred to me that the same procedure could be followed in other subjects, provided a standard for each question coud be set up such that failure or success in reaching it could be accurately determined. Under such circumstances each child's answer to a question might be rated as right or wrong (perhaps satisfactory or unsatisfactory would be a better term), and no part credits for partial success need be allowed. This method presented no particular difficulty in arithmetic. In the content subjects, however, of geography, history, and English grammar, the task was not so easy. It is clear that the method of right and wrong cases may be much more easily applied in the content subjects to the more formal aspects of them. It is clear that each of these content subjects has a body of facts connected with it about which there is little or no dispute. Answers to questions about these facts may, with propriety, be rated either as right or wrong; and, concerning the answers, no one who is informed can be in doubt as to whether they are right or wrong.

I realize that you will feel some disappointment that geography, history, and grammar have been treated only in their more formal aspects—that is, that questions are of the informational type almost exclusively. I do not believe, however, that this affords justification for any feeling as to the limitations of the test method when applied to content subjects. There are three reasons why this appears to me to be true.

In the first place, there are parts of every fundamental school subject which are so fundamental that ignorance of them is a misfortune, and the various States have defined what the common school education shall be. They have defined it in terms of fundamental parts of fundamental subjects, and they certainly contemplate that the child shall be informed, shall know, shall remember, if you please, these fundamental parts of fundamental subjects. The world, rightly, I think, judges praise to the well informed person, and when you find the business man criticizing the schools, you generally find him doing it on the basis of things that children don't know.

In the second place, we need to be little disturbed about the fact that these questions are information questions because there is a direct relationship between information and thought in any given field. Those who do well in an information test will also do well in a test requiring inference or deduction. Just before I left New York I gave an informational and a thought test in history to the same groups of children. I have not completely worked out the conclusions yet, but the correlation coefficient between information ratings and thought ratings is unquestionably positive and high. If further study of the matter confirms this, the reliability of information tests as indirect measures of total ability within the field in question becomes apparent. The doctrine of indirect measurement is no new thing. For a long time we measured fatigue by measuring the distance between the points of the aesthesiometer, and altho the correspondence between cutaneous insensitivity and fatigue has been more or less discredited it wasn't discredited on the ground that the fatigue element could not be measured, provided there was a correspondence. The method of indirect measurement is well illustrated by the thermometer; we don't measure the heat, we measure the height of the mercury column, which varies directly, or nearly so, with the heat. It is not always necessary to measure directly the thing we want to know about, but it is sometimes possible to measure a thing which varies with it and which in itself is much more easily measured than is the thing which we want to know about.

In the third place, it is possible to develop a technique with respect to thought questions whereby they may be handled in practically the same way that these information questions were handled in the work at New York. I can only suggest the lines along which this development may take place. The first need is to secure a judgment as to the value of certain types of answers. Suppose that the question is the following: "Check the five most important topics in the following list: Paul Revere's Ride; The Purchase of Alaska; The Discovery of Lake Champlain; John Brown's Raid; The Monroe Doctrine; The Capture of Major André; The Visit of Lafayette to the United States; Magellan's Voyage Around the World; The Boston Tea-Party; Construction of the Panama Canal; Washington's Journey to Fort Dequesne; Sheridan's Ride; The Purchase of Louisiana; Making of the First American Flag by Betsy Ross." This is clearly a matter of judgment. The answer, from one point of view, must be regarded as correct, no matter what it is. Betsy Ross and the American Flag may be allowed to vie in importance with the Monroe Doctrine and the Louisiana Purchase, but most of you if you were rating answers to this question would feel that the child who checked "Betsy" was not entitled to as much credit as another child might be who refrained from doing so. Just where one might draw the line and say that this topic or that should not be included among the five most important is a question which all of you, I am sure, would feel to be difficult. You would feel that any decision on your part might be arbitrary and somewhat indefensible. To set up the judgment of one person against another is repugnant to our ideas of proper procedure. We do not, however, feel this compunction to such a degree when we find that another person agrees with us in our judgment; and if we find yet others in agreement with us, our opinion deepens into conviction and we reach a point where we feel almost as certain of our ground as we would be in the case of an answer to a fact question such as: "In what war was the battle of Gettysburg fought?" What I am coming to is this: It is quite possible to secure the judgments of competent persons as to typical answers, and, having secured a concensus, to use the consensus in the same way that facts are used in the rating of information questions.

It may seem that the inferential question which I have used as an illustration is of a peculiar type which may lend itself to treatment by the method of right and wrong cases more readily than would most questions requiring a pupil to exercise individual thought. No one would deny, I should suppose, that the qualities of judgment and estimate of values called for in the question about checking the five most important historical topics are among the qualities which we most desire to cultivate in our school work. There are, however, many other types of mental processes which it is equally desirable to train and foster.

Let us therefore take another illustration which will probably present as much difficulty in the application of the method of right and wrong cases as any that would be likely to be used. Suppose the question to be: "Account for the fact that the climate just east of the Rocky Mountains is unusually dry." I have actually used this question and have found it quite practicable to rate it as either right or wrong without allowing part credits, provided the necessary preliminary judgments are secured as to what characterizes a satisfactory answer. Taking a rather wide selection of answers at random one may manifold them and issue them to a number of competent judges. From the returns which I myself received regarding this question, it did not prove to be difficult to formulate satisfactory answers, or rather elements necessary to a satisfactory answer. This does not mean that only one answer was accepted as correct. According to the judges, several sorts of answers would be acceptable, involving different elements more or less expressly stated, such as the fact that the west winds are saturated with moisture; that the mountains act as barriers; that the air in rising over the mountains is cooled, thereby precipitating its moisture; that the winds from other directions than the west have been deprived of their moisture before reaching this region "just east of the Rocky Mountains". The procedure in thus standardizing answers to thought questions is rather tedious; but it is perfectly practicable and surprisingly satisfactory if the number and importance of the preliminary judgments are sufficient. I think, therefore, that we are ready to set up scales and standards of achievement in content subjects, and I think that it will be done along the line which I have suggested, and one phase of which I shall illustrate in this report.

The whole theory of scale derivation has taken on form and substance. It is apparent, for instance, that there are two methods developing in scale-making, viz., the judgment method which Thorndike and Hillegas followed in penmanship, drawing, and composition, and the ratio method which I used in spelling and which has since been followed by Ayers in the same subject and by Trabue in language and Starch in arithmetic.

It may readily be shown that the school subjects are susceptible of arrangement in a certain serial order which will indicate the methods of scale derivation applicable to them. At one end of the series will be such subjects as spelling and arithmetic, which lend themselves particularly well to the ratio method, that is, to the expression of the relation between the actual number of correct responses and the possible number of correct responses. At the other end of the series are such subjects as composition and penmanship. Scales for these subjects must be derived by the judgment method. One sample of handwriting is better than another, not as a fact but as an opinion. A specimen of English writing is better than another, precisely because competent people think it is better. Between the extremes of the school subjects (represented on the one hand by arithmetic and spelling, and on the other hand by composition and penmanship) are a number of subjects to which the ratio method and the judgment method may both apply, according to the material which enters into the scales to be derived. Geography and history may typify these intermediate subjects. That there are parts of these fields so precise and unequivocal as to lend themselves to the same sort of treatment that may be given to spelling, no one will doubt who reads the geography and history questions which you have in your hands. As to the parts of these intermediate subjects which are not so definite, the judgment method may play an important rôle. It may do so on the one hand purely on the analogy of the judgment method used in the derivation of the Thorndike handwriting scale; that is, it may simply employ the theorem, "Differences which are equally often noticed are equal." Answers to questions in geography, history, science, or literature will then be judged pair by pair as to differences in merit, and scaled directly as a result of such judgment. This method is perfectly feasible, and there are no doubt parts of these subjects which will be best scaled in this manner. Or, on the other hand, the judgment method may be applied in conjunction with the ratio method in some such way as I have indicated above, that is, by securing a basis of judgment as to the rightness of the answers.

Thus you will see that I do not think that the limits of scale derivation have been reached; indeed, I do not think we have much more than embarked upon this particular phase of educational inquiry. We shall have, before long, scales in all school subjects, and not merely one but many in each subject. For instance, we shall have for spelling not only a general scale but one for each grade. In arithmetic we shall have a variety of scales, not only those for each grade, but those for oral and written work, abstract work, and problems. In composition we shall have scales not only for each grade, but also for the different types of discourse and for letters of various kinds. The movement, therefore, for standardization is only in its infancy. To my mind it is one of the most hopeful movements in education. It is unnecessary for me to enlarge upon this point to an assemblage gathered under auspices such as these. I think, however, that our supervision will be vastly improved by it; that our children will be more rapidly and effectively taught; that inefficient teachers will no longer be able to hide behind our ignorance; and that the far-off and dubious aim of education—an aim too remote to be effective to the general practitioner—will be replaced by a goal which is in sight, by a motive which is dynamic and energizing, and by an appeal which is not a generalization nor a hope deferred, but an example of what pupils have actually done—an example so concrete that it cannot be misunderstood, so obvious that it cannot be dodged, and so fair and impartial that it cannot be resented.

It is exceedingly important that the exact procedure in administering of these tests should be set forth, but to arrive at the scales themselves this morning it will probably be necessary for me to take this up at the round table this afternoon, should you want me to do so. It makes a whole lot of difference how the tests are given. It makes a whole lot of difference how they are rated, and if you are going to go back to your homes and use any of these, you should know how it is done; not that my way is any better than your way would be, but it may be different. The test papers were sent out by the city superintendent to the principals with instructions. At the central office when the papers were returned, after having been rated by the teachers, according to instructions, they were re-rated on a one-fifth random sample basis. If after selecting one-fifth of the papers, the number of reversals of a teacher's ratings was less than 3 per cent of the questions rated, the set was considered to have been satisfactorily handled by the teacher. If there were more than 3 per cent of reversals, an additional one-fifth of the papers were selected, and if there were not then less than 3 per cent of reversals, the papers were sent back to the school for re-rating.

As indicating the value of the arithmetic material for test purposes, I call your attention to this Figure I, which shows the frequency of the ratings in the two halves of the seventh grade in the March test. You will notice that in the seventh grade, first half, there were many children who were unable to get a single example right. This horizontal scale is for the numbers of problems solved correctly; the vertical scale is for per cents of children who solved them correctly. About 13 per cent of the lower seventh grade children were unable to solve a single example. The test material in arithmetic, therefore, was not ideally adapted to the lower seventh grade because, of course, there is a wide variety of ability among these thirteen children out of one hundred, none of which is tested because they all get the same rating.

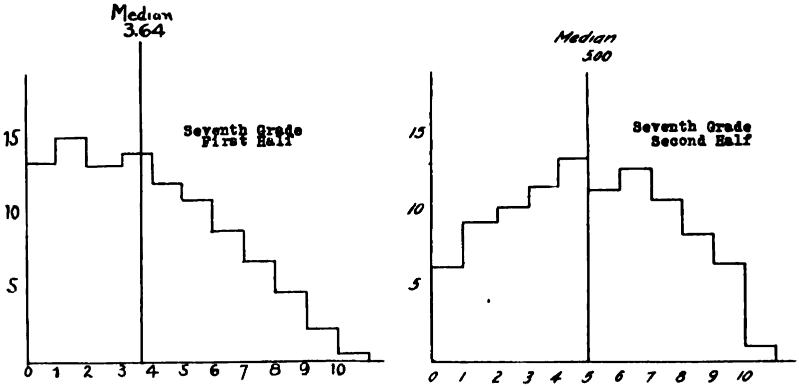

FIG. I. FREQUENCY OF ARITHMETIC RATINGS: PER CENT OF QUESTIONS ANSWERED CORRECTLY.

The situation is a little better in the seventh grade, second half. We have a surface of frequency which approaches more nearly the normal type, the children who did very poorly being more nearly balanced by those who did very well. The median in the lower seventh grade was 3⅔ examples done correctly out of 10; in the upper seventh grade it was exactly 5 examples.

Figure II is for the March test in arithmetic in the lower eighth and upper eighth grades. The surface is only fairly satisfactory for the upper eighth. Note the piling up of the children at the upper end. The medians are: for lower eighth grade, 6.2

problems answered correctly; for the upper grade, 7.8 answered correctly.

Permit me to remind you that this should be taken with some degree of caution. The problems are not of equal difficulty. Whenever any showing such as this is made, or any tabular showing concerning the number of examples correct or questions correct, or items of a test correctly solved, the elements (here the problems) are found to be decidedly unequal in difficulty. A tabulation or a graphic showing, however, of the personal scores of children, if we understand that it does not mean what it appears to mean—viz., that the problems are of equal difficulty—is useful, because, taken as a total measuring instrument, a group of ten problems such as you have here does have value for the comparison which it enables you to make between conditions in one place and conditions in another. The thing that we must look out for is that we do not judge that a child who answers 6 problems correctly does three times as good work as does the child who answers 2. We must make no such comparisons.

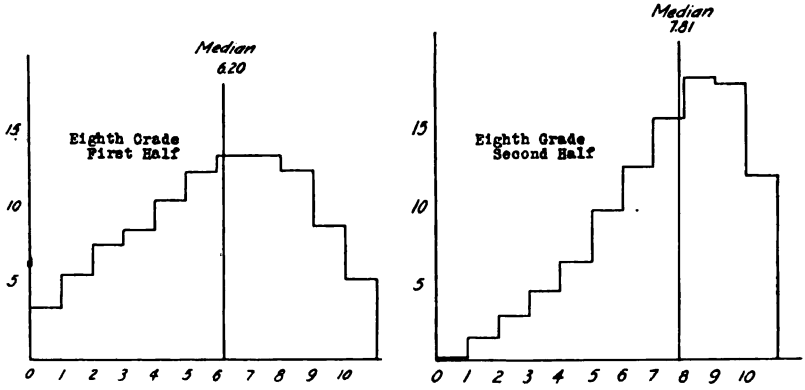

FIG. II. FREQUENCY OF ARITHMETIC RATINGS: PER CENT OF QUESTIONS ANSWERED CORRECTLY.

Before I show you any of the scales for the school subjects under discussion it will be necessary for me to give you a brief statement of the way in which the ratio method of scale derivation is applied. The fundamental assumption is that the ability of pupils in each grade is approximately of the normal type.

Figure III will give you an idea of the idealized surface of frequency which is commonly called normal. As I have experimented and studied the question of the distribution of ability among school children I have come more and more strongly to the opinion that this is the true pictorial representation of the distribution; in other words, I believe that the distribution of ability in each grade is substantially of the normal type, and I do not arrive at that from any hasty conclusion or from any desire, great tho it may be, to use the frequency surface of the normal type on account of its simplicity. As some of you perhaps remember, I experimented rather fully a few years ago with distributions of an asymmetrical character and the results were almost negative. It appears that the eliminative process which is going on in the public schools from the lower grades to the upper grades does not skew the distribution to any important degree. It simply moves it up.

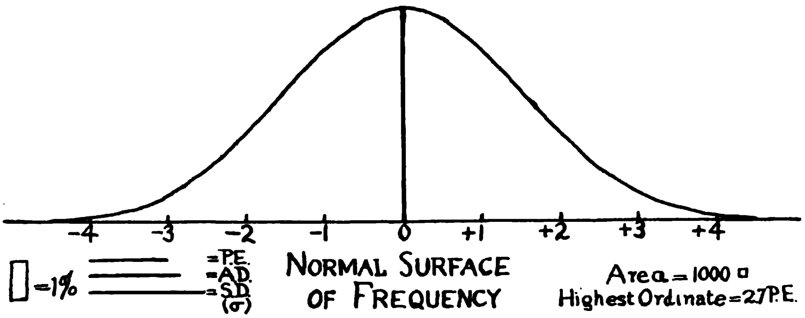

FIG. III. NORMAL SURFACE OF FREQUENCY.

The theory, therefore, upon which these scales are derived is based upon the assumption of a normal distribution of ability. When we say that a question in geography or a problem in arithmetic is answered by 50 per cent of the children, we mean that half of the children possess such ability as is necessary to answer the question or more ability than is necessary to answer it. Ability is measured along the base line of the figure; low ability being at left and high ability at the right; and the ability corresponding to a 50 per cent problem would be presented by such a point on the base line as would leave half the area of the surface to the right of its perpendicular, the right being the high ability end. It would be located here at zero (indicating) and this would be the perpendicular. Half the surface of the figure is to the right of the perpendicular.

Suppose that the problem were answered by only 25 per cent of the children of a grade. The placing of this problem would be at a point on the base line to the right of which only 25 per cent of the area of the normal surface lies. Such a point would be placed here (indicating), and the distance from the median ability to this point is by definition the "probable error" of the curve. The probable error, then, is the distance from the median to a point on the base line at which a perpendicular, if erected, will cut off 25 per cent of the area. This distance is our unit, and all measures of ability as shown in the following scales are in terms of it.

A question answered by 75 per cent of the pupils of a grade would be placed here (indicating) where the perpendicular would leave 75 per cent of the area to the right. This would be at −1 P.E. A question answered by 91 per cent of the children would be here, at about +2 P.E. (indicating). Any given percentage has its point on the base line, a perpendicular at which leaves to the right that same percentage of the area. In our work the area to the right of such a perpendicular represents the proportion of pupils whose ability is such that they can answer the question correctly.

The diagram which I now show you (Figure IV) is a series of scales for the difficulty of 20 problems in arithmetic. There are 5 scales, one for each of the 4 highest half-yearly grades of the elementary school, and 1 general scale for the 4 grades combined. The series of numbers at the top of the diagram (indicating) are P.E. units multiplied by 100. That is to say, 180 means 1.80 P.E. The questions are indicated by numbers along the scales and under the P.E. value to which they belong. If the diagram were complete there would be erected on the entire top line a very large normal surface of frequency whose highest ordinate would be at zero, and 25 per cent of whose area would lie to the right of +100, with 75 per cent to the right of −100.

Notice that the numbers below each scale line are the numbers of the problems in the March test, while those above the line are the numbers of the problems in the June test.

The second series of figures at the top of the diagram (indicating) represents the percentage of pupils who solved the problems correctly. You will notice that 75 per cent corresponds, as it should, to −100 on the upper line, and that 25 per cent corresponds to +100. Other correspondencies are as indicated thruout the extent of the scale.

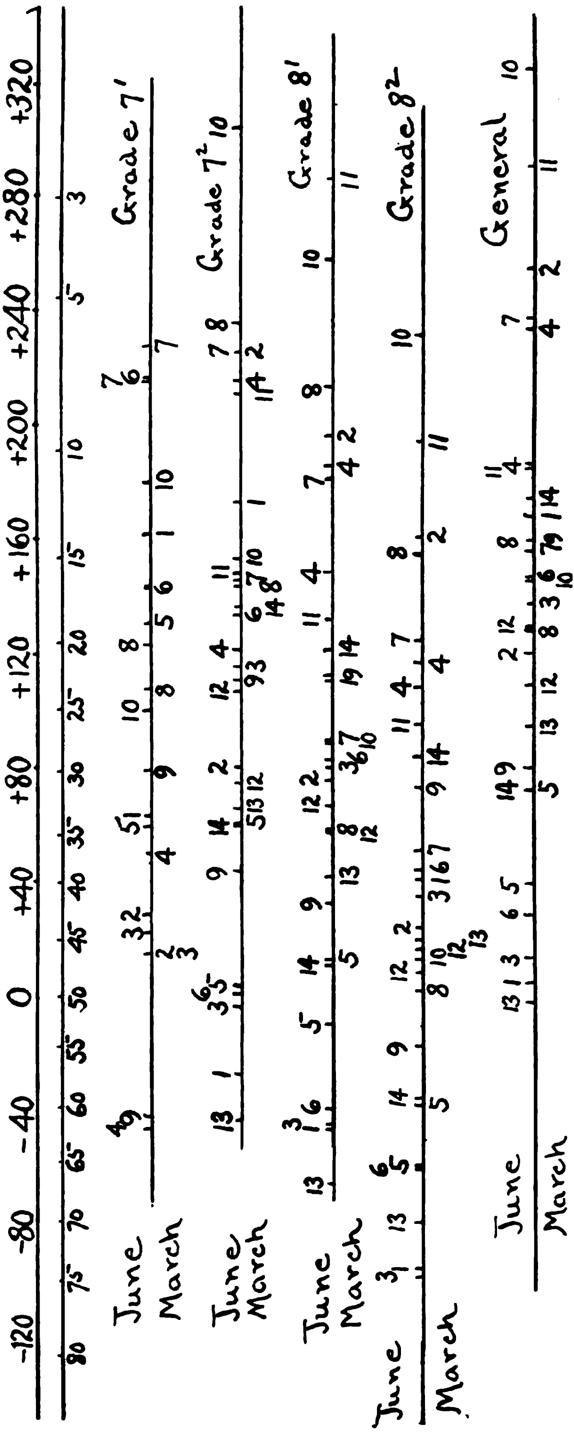

FIG. IV. SCALES FOR THE DIFFICULTY OF TWENTY PROBLEMS IN ARITHMETIC.

In the March test the "map problem" which you may read as No. 1 on the first sheet of the material I have given you,* was answered correctly by 7½ per cent of the pupils of the lower seventh grade. You will see that it is found between the figure 5 and the figure 10 of the per cents. By using a conversion table, it is found that a problem answered correctly by 7½ per cent of a group of pupils would be placed on the base line of the surface of frequency at +2.13 P.E.; and you will notice that it lies here a little to the right of 200 (indicating), according to the P.E. values of the top line. It will be interesting to follow this problem as it appears in the other grade scales. It was answered correctly in the upper seventh grade by 12.8 per cent of the children. This corresponds to 1.69 P.E. You will therefore find this problem located on the upper seventh grade scale about midway between 10 per cent and 15 per cent, and a little to the right of 160 (indicating Problem 1). In the lower eighth grade, problem 1 of the March test was solved correctly by 24.1 per cent of the children, which locates it at +1.04 P.E. In the upper eighth grade it was answered correctly by 41.6 per cent of the children, which places it at +0.32 P.E.

Notice the regular increase in the ability of the different grades as shown by their success in solving this first problem of the March test. If we join the points at which the problem falls on each of the scales, we shall almost have a straight line. This is true for a number of other problems. If it were true for all of them we might draw a straight line thru the four points for each problem. The slope of this line, or the angle it makes with one of the scale lines, indicates, so far as one problem can do so, the amount of increase in the ability of children in each successively higher grade. Notice that the angle made by the line joining the points for problem 4 of the June test (indicating) would be greater than that made by the same sort of a line for Problem 8 of the March test (indicating). This means that the data for problem 4 indicate less improvement from grade to grade than do the data for problem 8. The greater the angle, the less the improvement. If the angle were 90 degrees, no improvement would be shown. Theoretically all the lines should be straight and they should be parallel—that is, they should make the same angle with the scale lines. Doubtless if the number of children were very great, the straightness and parallelism of the lines would be nearly approximated. The slope of these lines is an interesting measure of the amount of improvement from grade to grade. It deserves a much fuller treatment than I can give it here.

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*See Appendix.

It will be interesting to note some of the characteristics of the problems in arithmetic as to their test value. Problems 7 and 9 in the March test, to which your attention is directed, as the "pencil" problem and the "factory products" problem, are what may be called median problems for the lower seventh grade. The first was solved correctly by 50.8 per cent of the children and the second by 46.9 per cent of the children. Ability to solve either of these problems, therefore, places a child, so far as the problem is concerned, at the average ability of the class, or better. These two problems may be used to good advantage as test problems for the grade. A child who cannot solve them affords evidence of being below the average ability of the grade. On page 2 of your material you will find two other problems which for lower seventh grade children in June proved to be practically median problems. They are the third, or "Texas" problem, and the seventh, or the problem about the farmer's wife. The "Texas" problem was solved correctly by 54.3 per cent, and the problem about the farmer's wife by 51.7 per cent of the children. In the same way we may select for other grades directly from this scale problems which correspond to typical grade ability. Such are, for the upper seventh grade, problems 5, 9, and 10 of the March test, and 8 and 10 of the June test; for the lower half of the eighth grade problems 4 and 8 of the March test, and 6, 9, and 10 of the June test; and for the upper half of the eighth grade, problems 6 and 10 of the March test and 1 of the June test. Problems indicating other than typical ability might also be selected. For instance, problem 4 of the March test—the problem about the economy of buying potatoes by the bushel—is a problem the solution of which implies for children of the lower seventh grade an ability which just places them in the upper third of the grade. In the upper eighth grade, however, its solution would place the child just short of the upper three quarters of his grade, or, conversely, a child who failed to solve it would give evidence of belonging to the lower quarter of his grade. In a similar way, other problems lend themselves well to use for purposes of diagnosis. Problems may likewise be selected of approximately the same difficulty. In fact, the entire March and June tests are of about the same difficulty, altho this equality does not show up in the scale, largely because the three months that elapsed between the giving of the tests makes the June examples appear easier than the March examples.

The method of placing the problems on the general scale is one which I will not enter into in detail at present. If you care to have me do so, I will describe the method this afternoon. It will be sufficient to say at this time that the placing of the problems is made by using all the data from the different grades and so combining them as to give the best average placing with reference to the median of the lower seventh grade. It is to be understood that zero means the median ability of the lower seventh grade. This will account for the fact that so few problems are placed below the zero point. I shall take up the remaining scales this afternoon, and shall try to give you an opportunity to ask questions.

Round Table: Principles of Scale Derivation with Special Application to Arithmetic, Geography, History, and Grammar

LED BY B. R. BUCKINGHAM

As matters developed this morning, I was not able to give you just the talk I had intended to give you. I had planned to take forty-five minutes for the presentation of my material. It was my intention to give you an opportunity this afternoon to ask questions about the presentation of the morning and to discuss it. Having been unable to complete my report and having been obliged to abbreviate parts of it, I shall first try to take up certain omitted topics and then to present the scales for geography, history, and grammar.

In the first place, I want to show you how the children's answers were rated. The score sheet which I use is being passed around to you.* You will recall that all questions are rated as either right or wrong, no part credits being allowed. All that is necessary, therefore, for a complete scoring is to indicate whether the question is right or wrong. The pupils are identified by number across the upper part of the squared surface. One sheet is to be made out for each class. If, however, a class consists of more than one grade, a sheet is to be made for each grade composing the class. In order to make a study of the difference due to sex, I have caused entries for boys to be made in black and those for girls to be made in red.

The directions to the teachers require them to number their classes, giving the first boy the number "one" and the remaining boys the next consecutive numbers. If a mixed class had 16 boys in it, the first girl would be number 17, the next 18, and so on. The horizontal totals of scores give the question results, and on the right you will notice two triple columns, one for the number of answers not correct, and one for the number correct, each divided into boys, girls, and total. At the extreme left are listed the questions either by number or by a catch phrase

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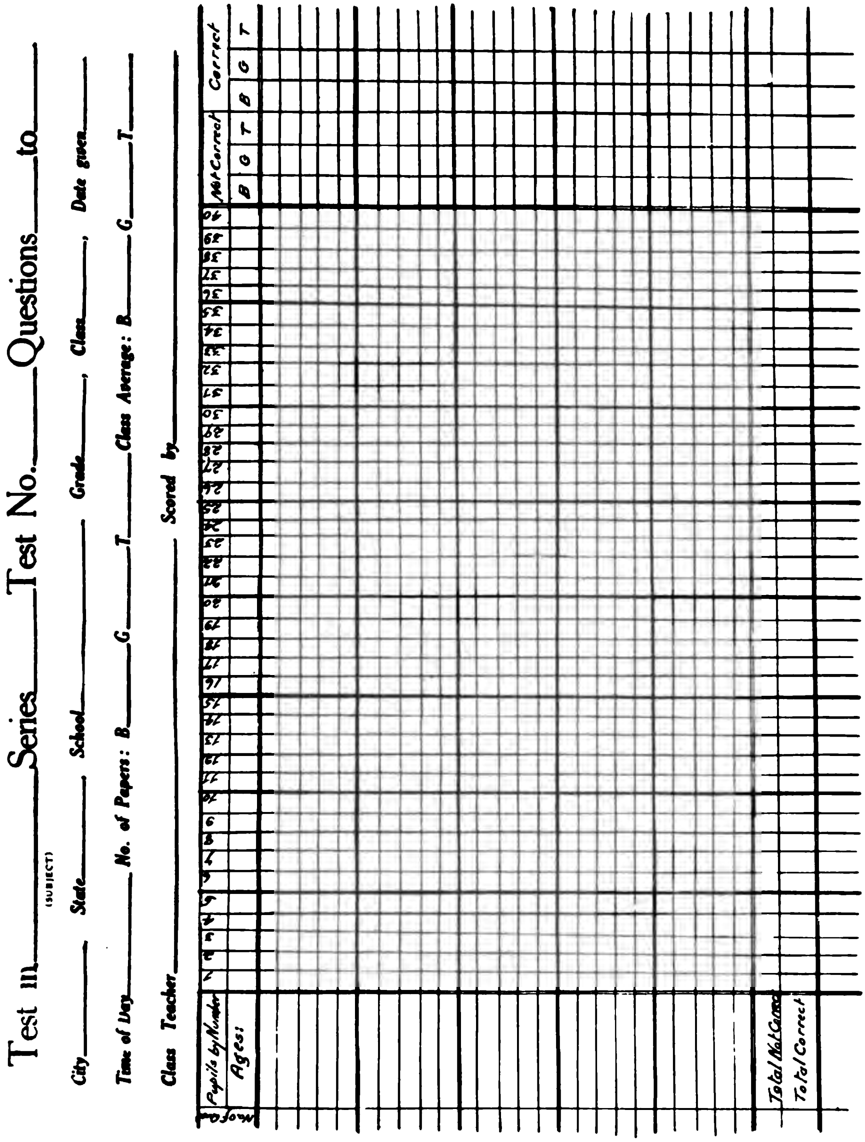
*Figure I.



Test in ______ Series ______ Test No. ______ Questions ______ to ______
(SUBJECT)

City ______, State ______, School ______, Grade ______, Class ______, Date given ______

Time of Days ______ No. of Papers: B ______ G ______ T ______ Class Average: B ______ G ______ T ______

Class Teacher ______ Scored by ______

Pupils by Number
Ages:
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
Not Correct
B
G
T
Correct
B
G
T
Total Not Correct
Total Correct

FIG. I. SCORE SHEET.

and a number. For instance, in arithmetic we may call question number one of the March test the "map question", because it is about the scale on a map; question number two may be called the "milk-man question", number three, the "fruit question"—anything to distinguish it, altho, of course, that isn't exactly necessary. The number will suffice.

Question number 1 may be supposed to have been entered; and on the line running from left to right, score marks show the number of times it was incorrectly answered, black marks being for boys who got it wrong, red marks being for girls who got it wrong. At the right, under the "Not correct" caption, the number of boys who got it wrong will be shown, then the number of girls who got it wrong, and the total of the two. Let us suppose that the number of boys who got it wrong was 8, and that there were 15 of them in attendance. Accordingly, 7 must have got it right, and 7 will be entered under the caption "Correct" and the sub-caption "Boys". If there were 18 girls in the class and 7 got it wrong, that would leave 11 to be entered under the sub-caption "Girls", and the 7 and 11 added would give 18 as the number in the class who got the question right. The vertical totals will give the pupils' scores. Suppose pupil number 1 gets questions 3, 7, and 10 wrong. Under the number 1 (his number) and opposite question numbers 3, 7, and 10, score marks will be entered. The total at the bottom after "Total Not Correct" will be 3. The "Total Correct" will be 10 less 3, or 7, which is the pupil's score.

That is the scheme of this double entry score sheet, and nothing that I know of gives such richness of detail as does this kind of a score sheet. You will find, as I go a little further and tell you about how the scales are derived, that it is precisely this richness of detail which we need and which customarily we do not get.

Besides the uses illustrated in this report there are many others to which such a score sheet may be put. Not only does it give pupil scores and question scores, but it permits either of these scores to be distributed by cities, States, schools, grades, or classes. The effect of the date of giving the test—whether early or late in the term—the effect of the time of day and of the size of class may be studied. Sex differences both in gross and for different types of questions may be shown; and all the matters which I have just referred to may be related to the ages of the children. By using other kinds of marks besides score marks, types of errors may be studied. Thus, in spelling, I have used a cross to indicate illegibility, a circle to show that the word was omitted, an "a" to indicate an absurd form of spelling, and an "s" to show a substitution. I should strongly advise all teachers to rate their ordinary test papers by using some such double entry score sheet as I am showing you. It serves equally well when a certain number of credits is assigned to each question; and the knowledge to be obtained from such an analysis of material will become more and more valuable as the years go by. I said something this morning about the waste involved in failing to keep the results of tests after their immediate purpose has been served. This is the form in which I should file the results, attaching a copy of the questions to the score sheet. For purposes of identification, I should have each pupil keep the same number as long as he was in my class, and should file against the set of score sheets a list of the pupils' names and numbers. According to a teacher's interest, additional data might also be filed with a score sheet, such as the amount, character, and recency of the instruction given the children in various phases of the test, the condition of the room in which the test was taken (temperature, humidity, ventilation, illumination), what kind of work the children had previously been doing during the day on which they took the test, the method of conducting the test (directions given, helps, if any, amount of time, etc.), who conducted it, and for what purpose.

This morning I showed you a scale for some problems in arithmetic. I shall now take up the subject of geography. I have already told you something about the selection of the questions, and they form part of the material which you have in your hands (see Appendix). There were 20 questions in the March test and the same number in the June test. The scale, therefore, for geography, shows 40 questions. The appropriateness of the test material from the point of view of the difficulty of the questions may be judged by the extent to which the surface of frequency for each of the grades corresponds to the so-called normal surface.* You will gather from these diagrams that improvement in geography from grade to grade is not great. Such is indeed the case. Since the median for the lower seventh

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*At this point diagrams were shown in which was given, for each grade, the percentage distribution of pupils answering correctly no questions, one question, two questions, etc. These diagrams are not reproduced here. Attention was called to the almost ideal character of these surfaces of frequency. The medians were as follows: For the lower seventh grade, 10.75 questions; for the upper seventh grade, 11.12 questions; for the lower eighth grade, 12.17; and for the upper eighth grade, 13.76.

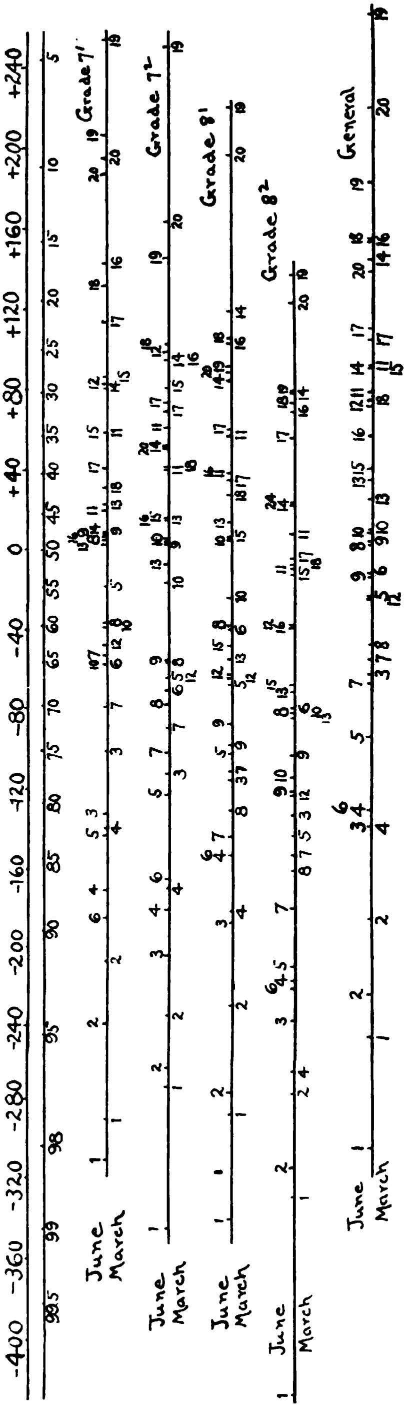

FIG. II. SCALE FOR DIFFICULTY OF FORTY QUESTIONS IN GEOGRAPHY.

grade is 10.75, and that for the upper eighth grade is 13.76, it appears that the added year and a half of school life have enabled the children of the upper eighth grade to answer, on the average, just 3 more questions correctly out of these 20.

The diagram which I show you here (Figure II) is the scale for the difficulty of 40 questions in geography. I take it that you are more interested in the scaling of the content subjects, or something from the content subjects, than you are in anything else that I could offer to you, and I am quite sure that nothing that I could give you would be newer or more original material. I am sorry that this picture does not show up better on the screen. In respect to the amount of material (40 questions), it is the best scale I have to offer this afternoon. The easiest question is located here on the general scale (indicating); it is question number 1 of the June test. The question is, "In what country is London?" In the lower seventh grade the same question also appears as the easiest; 98.2 per cent of the children answered it correctly. This places it on the P.E. scale at −311. This question number 1 of the June test, you can see, is a little to the right of 320, or towards zero. You will also note that this 98 per cent figure (indicating on lower series) is also regarded in the placing of the question, because, as I said a moment ago, 98.2 per cent of the children got this question right.

Notice how this question runs. It is, as I have said, the easiest in the lower seventh; again, it is the easiest in the upper seventh; again, in the lower eighth, and consistently, in the upper eighth. Consequently, it becomes the easiest question when all grades are considered, as the general scale shows.

You understand that these figures along here, the upper figures on each scale, represent the June questions; the lower figures represent the March questions. The hardest question was number 19 of the March test. The question reads, "South of the equator, in what direction do the trade winds blow?" This nineteenth question of the March test is located, for the lower seventh grade, right here where I point, having been answered by about 4 per cent of the children, which gives it a position at +254, according to the P.E. values. You can see that it is also the farthest question to the right (and hence the hardest) for the upper seventh; it is likewise the hardest for the lower eighth; and again, for the upper eighth, consequently, of course, for all combined.

You have no doubt noticed that while the first June question is always the easiest question, and while the nineteenth March question is always the hardest, there is not the same permanence of station for the intermediate questions. As I pointed out in considering the arithmetic scale, an ideal arrangement of the questions would be such that parallel lines might be drawn connecting each series of points for the same question. Now, altho this ideal arrangement is apparently not at all closely approximated, there is, nevertheless, a substantial permanence of arrangement, in the sense that the easiest question in one grade tends to be the easiest in any other grade, the next to the easiest in one grade tends to be the next to the easiest in any other grade, and so on. This tendency is not easily seen in the diagram unless you scrutinize it carefully. It is so strongly present, however, that the correlation coefficient between the ratings of the March questions for the different grades, as obtained by the "Foot Rule" method, is in no case less than +0.90, and in 2 of the 6 possible pairings it rises to +0.99. This means that the test value of a question in the lower seventh grade is essentially the same in each of the other grades. The hardest question remains the hardest question, the easiest question remains the easiest, and the questions which rank between tend to hold their positions for each grade in the order of difficulty. So strong is this tendency that for the March questions there is an exact correspondence thruout the 4 grades in 5 of the 20 instances. Between consecutive grades there is an exact correspondence in more than half the cases, and in no case is the rank-difference of a question more than 6. Question number 6, located here at −59 P.E. for the lower seventh grade (indicating), is the sixth in order from the left; that is to say, it is sixth in point of difficulty for that grade. The question is: "Name a leading State of the United States in the production of cotton." In the upper seventh grade it is likewise sixth in order of difficulty. In the lower eighth grade, however, you will find by counting along the scale that it is eleventh in difficulty, while in the upper eighth grade it is twelfth. Why it should be more difficult, grade considered, for an eighth grade child to name a cotton State than for a seventh grade child, I do not know.

It would be interesting to go over these questions in detail, comparing their importance and test value for each of the grades. I am afraid if I tried to do this, I should only succeed in being confusing and I am sure I should consume time. Median questions, however, are so significant, and may so easily be selected from the scale that I shall call your attention to some of them. The reason why median questions are interesting is that they reveal something concerning typical grade ability. In this sense, question 5 of the March test, located here, may be selected for the lower seventh grade. A child who is able to answer it shows, so far as one question can do so, an ability which is at least that of the midmost child of the lower seventh grade. The fifth question is, "Name a railway system connecting New York and Chicago." Fifty per cent of the lower seventh grade children in New York City can answer that question.

It will readily occur to you that some of these questions have a local significance; that perhaps 50 per cent of the children in Wisconsin, Montana, or Utah wouldn't be able to do that. The great majority of questions in the geography scale, however, are quite independent of such local conditions. As a matter of fact, when we have the equipment of scales that we desire, local geography will have its own local scale.

Another lower seventh median question which you may note on your list, if you care to, is number 8 of the June test: "What river forms a portion of the boundary between Europe and Asia?" This is a question, for instance, which is quite independent, I should say, of any locality in the United States. Number 9 of the June test is likewise a median question, "What circles bound the torrid zone?" Also number 13, "Name an important city on the Danube River"; number 14, "What State is south of Utah?" and number 16, "Name an important city on the Clyde River." All these questions appear to require at least typical lower seventh grade ability to answer them; and they appear also to be as likely to do so in one school as another so far as its location is concerned.

For the upper seventh grade, from the March test, the ninth question is one which only half the pupils can answer. The thirteenth question is also not far from the 50 per cent mark, as you can see. About 45 per cent of the upper seventh grade children can answer the question "From what is latitude reckoned?" For the upper seventh grade, from the June test, the tenth and thirteenth are likewise median questions. For the lower eighth grade, the fifteenth question from the March test is a median question. For the upper eighth, such questions are the eleventh, seventeenth, and eighteenth from the March test; and the eleventh from the June test.

It is interesting to note that some of the questions in geography are not answered correctly by as many children in higher grades as in lower grades. This is, of course, not generally true, but is sometimes true and ought to be pointed out. If more participants took part in the test and if a larger number of cities were represented, some of these irregularities would doubtless disappear. The amount and recency of instruction has something to do with the fact that the figures for these questions do not progress regularly from one grade to another. Probably the best plan would be for us to coöperate in the further testing of these questions, and if, after results have been obtained from a considerable number of participants, some of these inversions do not disappear, to reject these questions from further consideration. I am sure that even with geography, where this feature appears to be most prominent, it would not be difficult to scale 100 to 150 entirely satisfactory questions out of the 180 which I have on hand.

It will readily occur to you that in all these subjects and perhaps particularly in geography, the value of the scale will be diminished in proportion to the number of times it is used. It represents present conditions for schools in New York which are thought to be fairly typical. The best remedy for overcoming the difficulty due to familiarity with the scale is to enrich it with a great number of questions, to such an extent that familiarity with the scale will come to mean familiarity with the subject itself. When this condition is brought about, the usefulness of the scale will have been abundantly demonstrated. It will not cease to have value because children will not learn all the questions (we need give ourselves no uneasiness about that), but it will need readjustment to changed conditions.

It is a curious thing how little effect instruction has, sometimes, on matters of this kind. Did you ever give the Binet test to children who had been coached for it? If you have, you know how little good it did them. The effect of the most careful instruction is by no means to secure a perfect response. If such were not the case, words like "believe" and "receive" would not be misspelled by 50 per cent of fifth grade children, nor the word "separate" by 50 per cent of seventh grade children. Everybody knows that the word "separate" is a catch word, a hard word, and every teacher teaches it as such, and yet children continue to miss it, until, as it seems, they have reached a certain maturity or have a sufficient need for it to ensure its accurate use.

I have a great more material in hand for a geography scale than is shown here. I have returns from 180 questions of which these 40 are a sample. If any of you care to see some of the rest of the questions, I shall be very glad to show them to you, and also to tell you how hard they are. The material, however, is so voluminous and it has so lately reached my hand in usable form that it will probably be several months before I shall be able to present it. Even then, the number of participants for many of the questions will be too few to be ideal.

For questions which I am showing you today, however, the number of participants seemed to me to be sufficient for practical purposes. There were tested in each of the subjects about 3,000 in the lower seventh grade, 2,700 in the upper seventh, 2,300 in the lower eighth, and 2,000 in the upper eighth; a total of about 10,000 children. I say "about" because the number varied a little as between subjects.

The general scale for geography is an attempt to answer, without reference to any particular grade, this question: What is the difficulty of each question? Observe that the percentages shown in the upper line here have no reference whatever to the general scale, but only to the four grade scales. The P.E. values are the only ones that govern in the bottom scale. It will be interesting to note some of the uses which may be made of the general scale considering the June questions only. Pupils may be given these questions arranged in the order of their difficulty from 1 to 19, as follows: 1, 2, 3, 4, 6, 5, 7, 9, 8, 10, 13, 15, 16, 12, 11, 14, 17, 20, 18, 19. Pupils may be given the questions in that order and directed to answer them in that order. By being able to answer number 1 of the June test, "In what country is London?" a lower seventh grade child merely shows that he is not the poorest or the next to the poorest child among 100 pupils of his grade, taken at random. This is true from the fact that 98 per cent of the lower seventh grade children can answer this question correctly. Therefore, if he answers it, he only shows that he is among that 98. He is not the ninety-ninth or one-hundredth; that is, he is not the poorest or the next to the poorest.

By answering the second question, "What is the capital of the United States?" the same pupil would show evidence, as far as this question can show it, that he is not among the 5 poorest pupils among 100 selected at random from the lower seventh grade.

Similar statements could be made concerning the succeeding questions along the scale. By answering question 7, "Name the zones into which the earth is divided", he would show that he belonged among the upper three-quarters of the seventh grade, second half. By being able to answer the thirteenth question, he would show an ability which is practically typical of all the grades except the upper eighth. For that grade, he would barely escape being in the lower 30 per cent, because the thirteenth question is right here (indicating) for the upper eighth grade, that is, it is just about at 70 per cent. This means that 70 per cent of the children can answer it, and by answering it the child just escapes being in the lower 30 per cent.

In any use of the general scales, whether in one subject or another, we must provide for handling the problem of children who fail on easy questions and answer hard ones, in other words, for the children who do not answer all the questions of our general scale up to a certain point, and then fail altogether. We know in the Binet test, for instance, that children will answer questions up to a certain point, or do the things required of them up to a certain point, and then they will make one or two failures, and then a few successes, interspersed with failures and successes, for a little way beyond.

The present scoring method takes account of this. About the same plan would do here. Briefly, I would say this: I would give a child credit on the basis of what the P.E. values are for his continuous performance up to the point where he quits. Suppose he answers his first, second, and third of the geography June test; that brings him to −150. Take that as a point of departure and add his success from that out, and the result will place that child, as, say, a typical 7-A child, or a typical 7-B child, or among the first 25 per cent of the seventh grade, or whatever plan you adopt for purposes of classification. It is a rather simple matter to handle. The point is that the P.E. values of the upper part of the scale give an absolute rating which you can use. The per cents do not.

If you should wish to use questions in geography which differ in difficulty by about equal amounts, selections from this general scale may be made by choosing a series of points such that the distances between those that are consecutive are about the same. Such a series of questions, from the June test, would be: No. 1, at −305, "In what country is London?" No. 2, at −222, "What is the capital of the United States?" No. 3, at −138, "Name the six continents"; No. 7, at −68, "Name the zones into which the earth is divided"; No. 10, at +9, "Name a leading State of the

United States in the production of wheat"; No. 11, at +79, "For what industry is Pittsburg noted?" and No. 18 at +155 "Name three public buildings in Washington, D.C." The steps between consecutive questions in this series average 0.77 P.E., and none of the steps are larger or smaller than the average by any considerable amount.

In history, 12 questions were given in March and 12 questions in June. A diagram showing the distribution of individual ratings would indicate an approximately normal surface of frequency. As in the case of geography and arithmetic, the test material appears to have been adequate for the purpose, since it was not so difficult that the less capable children could not accomplish something, nor so easy that the brightest children were able to do all of it. The median for the lower seventh grade in the March test is about 4⅛ questions correct per pupil; that for the upper seventh grade is about 4½ questions; for the lower eighth grade it is 6¼ questions, and for the upper eighth grade about 7⅔ questions. All these medians are in terms of questions correct out of a possible 12.

This (Figure III) is the scale for history. The plan for placing the questions is the same as it was for arithmetic and geography. The total extent of the scale is from question 1 of the March test, "In what war was the battle of Gettysburg fought?" which was answered correctly by more than 90 per cent of the children in each of the grades, to question 7 of the March test, "Under whose administration was the Civil Service Commission established?" and question 12 of the March test, "To what political party in England did most of the settlers of Virginia belong?" Each of these two questions was answered correctly, on the average, for all of the grades, by about 14 per cent of the children.

Median questions in history for the lower seventh grade are, from the March test, No. 2, "At about what time was the first message sent by telegraph?" No. 5, "State one important general plan carried out by the navy of the North in the Civil War"; and No. 10, "In general, what was the attitude of England toward the South during the Civil War?" From the June test, question 4, "In what year did government under the Constitution of the United States begin?" and question 11, "Give the substance of one amendment to the Constitution made as a result of the Civil War", are likewise median questions for the lower seventh grade.

Without reading the questions, I may indicate as median questions for the upper seventh grade, No. 2 from the March

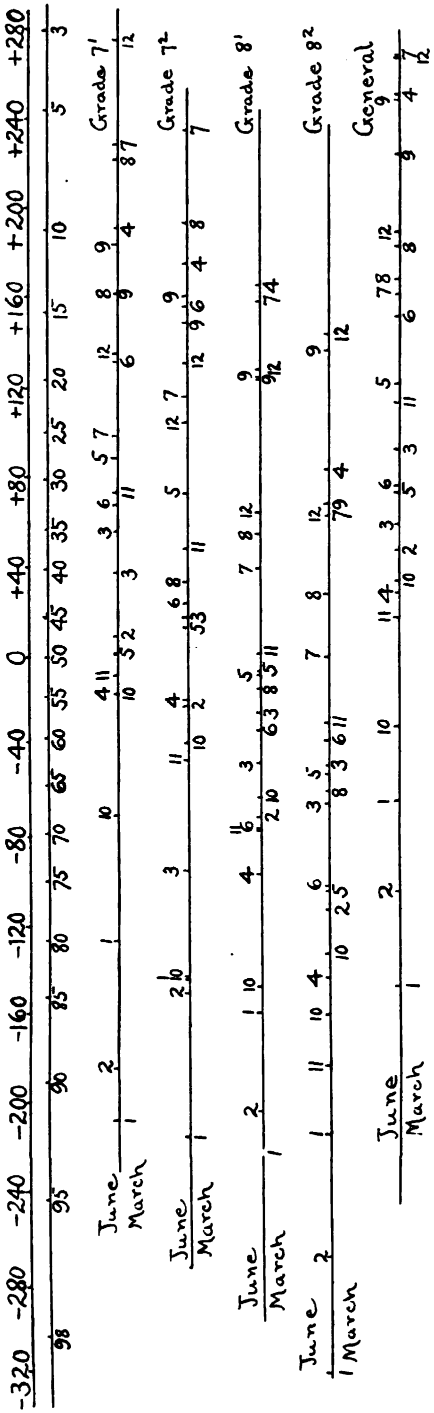

FIG. III. SCALE FOR DIFFICULTY OF QUESTIONS IN HISTORY.

test and No. 4 from the June test; for the lower eighth grade, Nos. 3, 5, 8, and 11 from the March test, and No. 5 from the June test. For the upper eighth grade No. 7 from the June test is a median question to a hair, and No. 11 from the March test is approximately a median question.

In grammar, two tests were given, one to the lower seventh grade, consisting of 10 questions, and one to the grades above the lower seventh, consisting of 14 questions. The results from these tests were not as satisfactory, so far as yielding a type of distribution approximating the normal surface of frequency is concerned. The test was too difficult, altho the distribution is quite as good as that of many tests from which important conclusions have been drawn in the field of experimental education.

The scale for grammar (Figure IV) shows the placing of 38 different questions. Fourteen were given both in March and June to the upper seventh, lower eighth, and upper eighth grades; 10 questions were given, both in March and June, to the lower seventh grade; but in each case 5 of these were the same as those given on the test of the upper grades. This leaves but five questions on each of the lower seventh grade lists in addition to those used in the upper grades. The scale for grammar shows the lower seventh grade independently of the others. You have in your hands the March and June lists of questions for the lower seventh grade, and you also have different lists of questions for the remaining grades, one for March and one for June. The numbers on these scales refer to those questions.

The hardest question for the lower seventh grade was the seventh from the March test, located here (indicating on scale). The question is, "Give an example in a sentence of the positive degree of the adverb 'better' and underline it." This question was answered by only 6 per cent of the lower seventh grade children. The easiest question for this grade was number 4 from the June test; and yet only 62 per cent of the children were able to answer it correctly. The question was "Underline the subject word once and the verb twice in the following sentence, 'The cold November rain is falling.' "

The nearest approach to median questions for this grade is found in questions 2 and 3 from the March test. You can mark them as median questions if you care to. In the grammar test for grades from the upper seventh to the upper eighth, the scales show that most of the questions were found to be too difficult. In the upper seventh, out of a total of 28 questions, there were

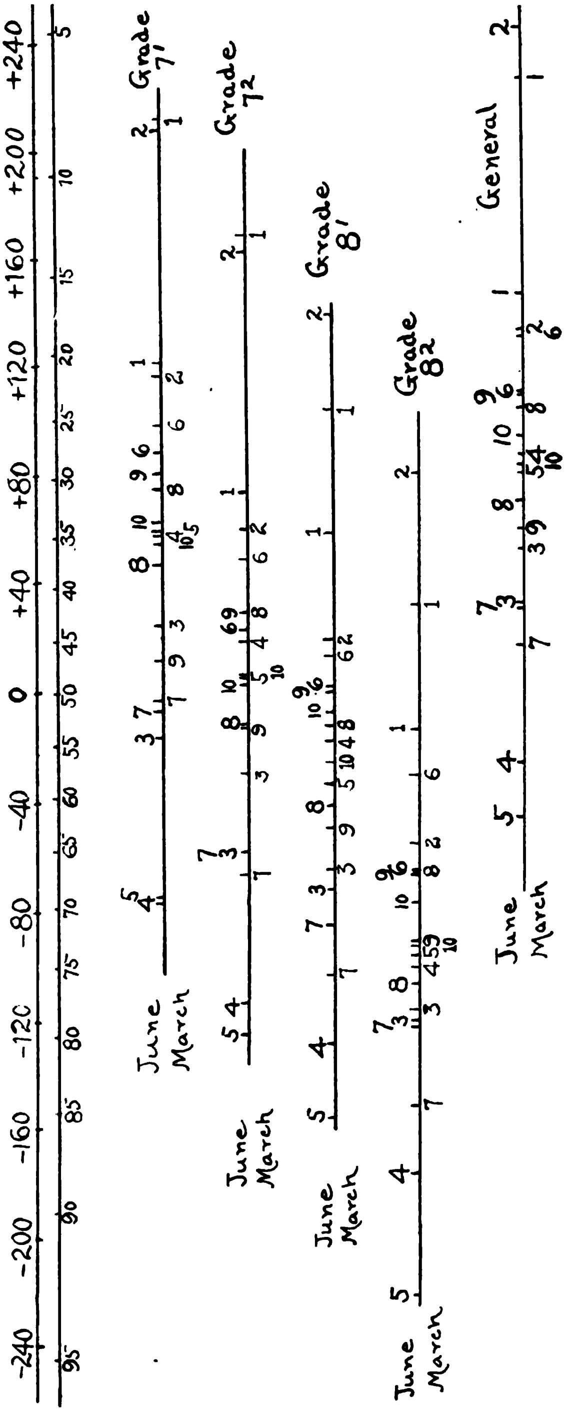

FIG. IV. SCALE FOR DIFFICULTY OF THIRTY-EIGHT QUESTIONS IN GRAMMAR.

25 questions, each one of which was answered correctly by less than one-half of the children. For that grade, the hardest question (only 2 per cent correct) was No. 10 from the June test. The question was, "Change the following complex sentence into a simple sentence, without altering its meaning: 'We saw that it was wise to give in.' " The easiest question (61 per cent correct) was number 13 of the June test: "Give an example in a sentence of an adverb of time, and underline it." In the lower eighth grade every question in the March test was answered correctly by fewer than 50 per cent of the children; and of the 14 questions in the June test, 9 were answered by fewer than 50 per cent of the children.

The test in grammar did not prove to be altogether satisfactory. A great many principals are doubting the wisdom of the teaching of formal grammar in the grades, and altho it is in the course of study in most cities, I fancy it is not being stressed as much as it used to be, or as is necessary for making a good showing on a test. We all know that the question of teaching formal grammar in the elementary school is being debated, and that those who are opposed to its place in the curriculum appear to be making out a good case. I doubt if I should have included a test in grammar as a test in one of the fundamental subjects, if I had not been particularly requested to do so. I should like to try these questions in the high school.

In the material which you have in your hands I have included a tabular showing for each question of all the subjects and the percentage of pupils who answered it correctly. In this tabulation all grades are combined. In the absence of further information about these questions, this tabulation may be taken as indicating a standard based on actual returns. If you give any of these questions to pupils in your own schools, it will, no doubt, be interesting for you to compare your results with this tabulation.

Before concluding this report I should like to give you a brief statement of the manner in which the general scales for each of the subjects were constructed. You will remember that in each of the diagrams giving the scales there was a line at the bottom on which was shown the arrangement of questions, irrespective of the grades. The method of constructing the general scale is rather straightforward, and anyone can employ the method without much technical knowledge.

In the first place, a double entry score sheet, such as I showed you at the beginning of my talk this afternoon, is necessary, because we can get from it both the question results and the personal or individual results. For the grade scales, all you need are the question results. When you know the number of children in each of the classes concerned who answered a given question correctly, all you have to do is to add these together and find the total number of participants, getting the per cent that the number of correct answers is of the total participants. This per cent value is to be transmuted into a value in which the variability of a normal surface of frequency is the unit. For this purpose we may use as our unit the probable error or the average deviation or the standard deviation. I have used the probable error because it is easy to define. It is an amount of ability above or below the median such as to include half the total number of ratings. In a normal distribution, if we arrange all the participants in the order of their ratings, and if we count, from the beginning, one-quarter of the way and three-quarters of the way, half the difference between the measures which we reach is the probable error.

The next thing to do is then to transmute the per cents into units of the probable error. For that you will simply need a table; I have published one in my study of spelling, and Dr. Thorndike has an abbreviated one in his "Mental and Social Measurements". As soon as you have these P.E. values, you mark them off on a horizontal line. In placing a question on a general scale, the essential things to know are: first, the placings of the questions on the grade scales, and, second, the intervals between the medians of each of the grades. For the general scale, any convenient point of reference may be taken and arbitrarily called zero. I have always used the median of the lowest grade in the series of grades to which the test was given. When such is the case, add to the value of a question for each of the higher grades the interval at which each grade median stands above the median of the lowest grade. To illustrate: The first question in arithmetic in the March test was answered by children in such a way as to be placed at +2.13 P.E. for the lower seventh grade, at +1.69 P.E. for the upper seventh grade, at +1.04 P.E. in the lower eighth grade, and at +0.32 P.E. in the upper eighth grade. To obtain the placing on the general scale, it will be necessary to add to +1.69 P.E. the distance between the medians of the upper and lower seventh grades. This difference amounted to 0.66 P.E. which, when added to 1.69 P.E., gives 2.35 P.E. as the distance above the lower seventh grade median, according to the record made in the upper seventh grade. The placing of this question for the lower eighth grade was, as I have said, + 1.04 P.E., with reference to the median of that grade. To refer this placing back to the median of the lower seventh grade, it will be necessary to add to 1.04 P.E. the interval between the median of the lower seventh and the median of the lower eighth grade. This I found to be 1.20 P.E. Adding this to 1.04 P.E. gives 2.24 P.E. as the placing of the question with reference to the lower seventh grade median, and according to the lower eighth grade record. The interval between the upper eighth grade median and the lower seventh grade median is found to be 2.06 P.E. When this amount is added to 0.32 P.E., the result is 2.38 P.E., as the placing of the question with reference to the lower seventh grade median, and according to the upper eighth grade record. If each grade above the lowest did as much better with the problem as the median intervals would lead us to expect, the placing of the problem on the record of each grade higher than the first would coincide with the placing on the lowest grade record. This condition is hardly to be expected, and, as a matter of fact, the best placing for the general scale is taken to be the average of the four placings from the four different grade records.

I have said that it is necessary to know the median intervals between the lower seventh grade and each of the grades above it, and I have given these for arithmetic as 0.66 P.E., 2.20 P.E., and 2.06 P.E. The determining of these distances is based upon the amount of overlapping of each grade record beyond the median of the next higher or the next lower grade. I am not altogether satisfied with the method, and I shall not enlarge upon it at this point, but shall give you, without further comment, a table showing, for each of the subjects, the median distances between consecutive grades, and also the per cent of pupils in each grade who equal or exceed the median of the next higher grade. The data for all these determinations are from the March tests only.

TABLE 1—DATA FROM MARCH TESTS

OVERLAPPING							
I. MEDIAN DIFFERENCES IN TERMS OF THE "PROBABLE ERROR"				II. PER CENT IN EACH GRADE WHO EQUAL OR EXCEED THE MEDIAN OF NEXT HIGHER GRADE			
Subject	7^1–7^2	7^2–8^1	8^1–8^2	Subject	7^1 on 7^2	7^2 on 8^1	8^1 on 8^2
Arithmetic. .	0.657	0.541	0.860	Arithmetic. .	33	36	28
Geography. .	0.132	0.428	0.845	Geography. .	47	39	28
History.	0.260	1.096	0.916	History.	43	23	27
Grammar. . .	?	0.498	0.827	Grammar. . .	?	38	29

The foregoing is offered as an indication for a method of analysis of test material. A few years ago it was the fashion to investigate methods of teaching, methods of organization, effects of fatigue, and the efficiency of individual teachers, without reference to the nature of the test material. The result was exceedingly confusing. No sooner did we reach a conclusion than we found ourselves in conflict with a different conclusion, equally authoritative. The whole matter of experimental education seemed to be in a fog.

Of late, however, it has been recognized that we are not in a position to investigate these attractive questions until we have taken the trouble to analyze the material which we use. A great deal still remains to be done, but so much has been accomplished that it offers a promise and a prophecy for a much more complete and systematic understanding of educational conditions. No doubt it is much more attractive to compare teaching methods than it is to evaluate and standardize, but the latter work must be done first. We must creep before we can walk.

In conclusion, therefore, I revert to the position which I took in the beginning, namely, that coöperative effort is the only means by which an abundant and satisfactory standard material can be obtained. No one person and no small group of persons can cope with the situation. The results which I have given you today represent the labor of many people, over a long period of time. It is not likely that conditions so favorable will often present themselves to anyone; but if we could have some kind of an association whereby we could pool our results and have them adequately handled by persons skilled in the sort of work necessary to be done, we could soon build up, for all the school subjects, a body of material which would enrich our knowledge of school abilities and processes, and dignify the name of teacher.

Efficiency Indices

B. R. Buckingham

I am not under any misapprehension as to the degree of popularity that may be ascribed to the lecure of a statistician. Nor indeed have I of late been under any misapprehension as to the degree of his own popularity. There are some things which he must find out and know and tell folks, but which are not always agreeable to those concerning whom the information is given.

Nor is it always easy to get this information. There is a certain glamour and glittering generality about the talk of those who lead you to suppose that precision is easily attainable in statistics. This, I assure you, is not the case. The adage about the superlative degree of liars—you know it—in its application to statistics has, as have most adages, a basis of truth. I know of no greater lies than those which can be perpetrated in the name of statistics, and I know of no branch of endeavor which requires more delicate handling in order to bring out the exact truth than does the business of statistics.

It is, at the outset, difficult to get information which is reliable. This is not always due to the disinclination of people to furnish the facts, but is often due to their misunderstanding and what we, in somewhat hasty moods, term their "stupidity". Two and two do not invariably make four.

The simplest direction which you can give to people is not so simple but that it will be misunderstood and evaded by some. I had occasion to get out a service card in New York City some time ago; each teacher was required to make out a card, and the first item on the card was the teacher's name. It never occurred to me that there could be any difficulty about Item 1, altho I did write a direction concerning it because I wanted to file the cards in an alphabetical arrangement and therefore desired to have the last name appear first on the line devoted to the name of the teacher. I therefore took the trouble to write a direction on the back of the card in this manner: "Item 1. Write your last name first."

Several hundred cards came back with the given name written first. I sent these cards back, pointing out the error and asking that they be made out in conformity with the direction for Item 1. Even then, one teacher sent in her card with the given name written first. I sent for the teacher, and placing the card and the directions before her, asked her to read the first direction and she read it as follows: "Item 1. Write your last name first." "Now," I said, "do it." Complying with my request, she wrote her last name first but placed it toward the right-hand end of the line. Afterwards she filled in her first name at the beginning of the line.

The conversation that ensued was one in which she had the best of it. She said that she had written her last name first, and when I said that of course I meant to have the last name written in the first position, she asked me, "Why didn't you say so?"

The matter of school reporting has grown to be one of prodigious importance. It has developed from very small beginnings to proportions where in each of the more advanced cities a large staff of people is employed. Special reports are likewise devised to supplement the regular report; and of late we have the school survey—a form which is becoming conspicuous in the development of educational reporting.

The purpose of city superintendents, however, has been the same from the beginning, namely, to give to the interested public information concerning the efficiency of the schools for which their reports were rendered. Aside from the descriptive part of such reports, the facts concerning registration have been given from the earliest days. The mere size of the school system was properly felt to be an important indication of the extent to which the schools were carrying out the purposes for which they were organized. When, at a later date, the facts concerning registration were related to the total population of the area to which the schools belonged, or to the population of school age, a considerable improvement was made in the matter of school reporting. At an early date, also, city superintendents began to report figures showing the number of pupils in attendance, and when these figures were related to registration figures, they became a standard element in school reports.

After a graded system had become well established and refinements had been introduced, the feature of reporting facts as to promotion became general. Subsequently, an effort was made to relate promotion facts to registration facts in much the same way that a relation had previously been shown between attendance and registration.

Again, within the last five or six years, it has become common for school reports to contain facts concerning the ages of children with respect to their grades.

These four steps in reporting, namely, the showing of registration, attendance, promotion, and age in relation to grade, constitute progressive steps in the method of reporting, whereby a city superintendent offers an appraisal of the school system of which he has charge.

Running parallel with these four kinds of reporting, there also appears in many reports a showing as to the economy with which the school system is administered. This showing has been developed in some quarters to a remarkable degree of precision. It has taken the form of statements of unit cost based on cost per pupil hour, cost per $1,000 of assessed property, and cost per capita of population. As a further indication of economy of organization, such facts have also been reported as average size of class, or ratio of the number of teachers to the registration.

All these elements of reporting have value as indicating the efficiency of the school organization from the administrative point of view. They leave untouched the quality of the teaching; nor are we to suppose that any system of schools is adequately reported even when all these elements are shown. They do, however, constitute a physical basis of school efficiency, and as such they are valuable and necessary.

I propose, therefore, to show for each of these classes of facts what I consider to be the best method of gathering the information about them and reporting it effectively. It is clear that if we can all use the same method, we shall gain greatly thru the opportunity for comparison as between schools and school systems. Comparisons may be odious, but nothing is more stimulating toward improvement in organization than the knowledge that comes from relating local conditions to conditions in other places. Comparisons between classes, between schools of the same system, and between systems, cannot be neglected, and, indeed, they lose nearly all their odium when standards are expressly stated in objective terms, and the comparison is instituted in such a way that personality plays no part. But the most effective of all comparisons is the one which compares the present attainment of an individual school or of a group of schools with the past attainments of the same school or group of schools. A systematic analysis carried out on this basis is productive of good effect. Effort with knowledge of results has been demonstrated to be far better than effort without knowledge of results.

The general principle which underlies the statement of facts as to attendance, promotion, and age is to *show actual conditions in relation to possible conditions.* This principle leads, generally, to the percentage form of statement. Specifically, we express the ratio of the number of children in attendance to the greatest possible number who could have attended, i.e. to the register or number belonging. Or, we express the ratio of the actual number of promotions to the greatest number of promotions that could have been made. Or, finally, we express the ratio of the number of children at age or younger to the entire number of children belonging.

The matter of attendance presents little difficulty. Remembering the principle that we are to express the ratio of actual to possible conditions, we shall first find out what the actual attendance is, and, second, what the greatest possible attendance might have been. On any given day, for a given class, the attendance is an objective fact which is easily ascertained. The registration of the class is equally well known, and the ratio of attendance to register for that day and for that class. To express the same fact for the class over a period of a week or a month or a year, it is only necessary to add the attendance for each day and the registers for each day of the period in question, and to divide the first sum by the second. What is done for a class may also be done for an aggregate of classes comprising a school, or for an aggregate of schools comprising a school system. In each case, the first term of the ratio should be the sum of all the daily attendances for the group in question, and the second term should be the sum of all the daily registers for the same group.

The procedure, therefore, is exceedingly simple. It is not always carried out, however, in the manner indicated. In not a few city reports, average attendance is expressed as a percentage of average register. This is always bad in theory and may be decidedly misleading. In any system there are almost always creations of new classes during the school year and consolidations of old ones, and, in very large systems, entire schools are sometimes created or discontinued. The average attendance of a class or school which has been discontinued and which, consequently, has been in session only a portion of the year, is based upon a less number of days than the number of days in the school year. The same is true of classes or schools created during the year. If the aggregate attendance of a class which ran for the first 25 days of the school year was 1,000, the average attendance would be 40. For the same class, the average register might have been 45. In arriving, however, at the attendance rate for the school or school system in which the class belonged, it would not be proper to use 40 and 45 as elements in arriving at the average attendance and register. The only safe way to compute the attendance rate is to ascertain the aggregate days of attendance for the group in question and to divide it by the aggregate days of register of the group for the given period.

Attendance as a criterion of efficiency is of fundamental importance. It is, to be sure, obscured by later refinements in our more highly developed school systems; but even in them its importance is clearly, altho perhaps tacitly, assumed; while in less highly developed systems it often becomes the most significant discoverable fact. In the Maryland survey the authors made no more effective presentation of the insufficiency of the State school system than that in which they showed the small amount of school attendance. Other and more refined measures of efficiency were often lacking, but when it was shown that the attendance rate on total enrollment was 52.8 per cent in 1880 and 65.3 per cent in 1914, abundant evidence was afforded on the one hand, that improvement had been made, and, on the other hand, that conditions were "still poor". From this fact alone we are prepared to find, as indeed we do find in other parts of the Survey, that conditions in general indicate substantially the same improvement and the same present inferiority.

Again, when comparison is to be made among large numbers of systems, facts as to attendance are among the few bases—apart from financial ones—upon which comparison may rest. In "A Comparative Study of Public School Systems in the Forty-Eight States", the Division of Education of the Russell Sage Foundation made a very effective presentation based mainly on data contained in the report of the Commissioner of Education for 1911. Attendance was one of the facts considered. At the close of the report, the 48 States were given a general rank and also a rank in each of the ten most important educational facts already considered. Attendance was again included, and its importance as a single criterion may be judged from the fact that the ranking of the States on attendance and their general ranking in the "ten tests of efficiency" was such that the correlation coefficient was +0.67 ("Foot-rule" method).

The attendance rate is not, as I have said, always computed in the same way. In the bulletin of the Russell Sage Foundation the attendance rate was taken directly from the report of the Commissioner of Education where the rate is based not on register but on enrollment—that is to say, it is based on the total number of different children who attended school any portion of the year. Now, there are a great many children who enroll and drop out and a great many others who do not enroll until the school year has more or less advanced. In a school system where semiannual promotions take place, all mid-year graduates and all mid-year entrants belong to the school but half the year. If their attendance were perfect, it would be but 50 per cent of the number of school days in the year. Correspondingly, perfect attendance of all pupils on register a portion of the year would be represented by a per cent less than 100. The method of basing the attendance rate on enrollment ignores the fact that 100 per cent should represent the maximum possible condition. In this method, 100 per cent does not represent anything which can be defined. Stating my criticism with reference to the principle I have already laid down, an attendance rate based on enrollment (total number of different children attending any portion of the year) fails to express the ratio of actual to possible conditions.

The attendance rate as an index of efficiency may appear to you of doubtful validity. It may be thought that local conditions affect the attendance rate in ways that cannot be ascribed to administrative efficiency. For example, small schools and small classes may be thought to be favored in securing high rates of attendance. In such schools, principals and teachers know the pupils intimately; they commonly know their parents also; they are more or less acquainted with their home conditions. Such knowledge is desirable from every point of view, and might be expected to operate to the advantage of attendance, without the result being properly attributable to the character of the organization or administration of the school. Similarly, the location of a school, the economic status of the community, the prevailing nationality, the average distance of home from school may be thought to have bearing upon the question of attendance, in ways that make comparisons between schools difficult or unfair. The investigations, however, which have been carried on in the measurement of abilities in school subjects suggest that all such factors are likely to be of less importance than they would be thought to be upon *a priori* grounds. The fact is that supervision, administration, and organization are words which are assuming progressively greater importance in school matters. "As the principal is so is the school" is more than an epigram.

So far as I have studied the question, it seems to me that the schools in any given school system may properly be compared on the basis of attendance, whatever the factors with respect to location, size, or community conditions may be. In particular, with reference to size, large schools seem to be quite as likely as small schools to have a high rate of attendance. In New York City there were 478 elementary school organizations at the close of the year 1914-15. The registers of these schools ranged from 22, for a one-room building in a rural section on Staten Island, to 4,488 for a huge organization in a thickly settled district in the borough of the Bronx. The attendance rate of the former was 91 per cent; the attendance rate of the latter was likewise 91 per cent. The average attendance rate for schools of less than 200 pupils was 88.0 per cent; that for schools of 201 to 400 pupils was 87.6 per cent; and that for schools of 401 to 600 pupils was 89.5 per cent. I have classified the schools, according to size, by steps of 200. The rates for these groups reach a maximum for the 1,201 to 1,400 groups, where the rate is 91.4 per cent. There is a slight falling off in the rates for the very large schools. In general, however, it may be said that instead of the small schools being favored in the matter of attendance, the large schools tend somewhat to have the higher rates. This is probably due to the factor of supervision. There is a tendency for large schools to be in the hands of competent principals.

The relation, however, between attendance rates and sizes of schools is best represented by the correlation coefficient, some steps in the derivation of which I shall now show you.

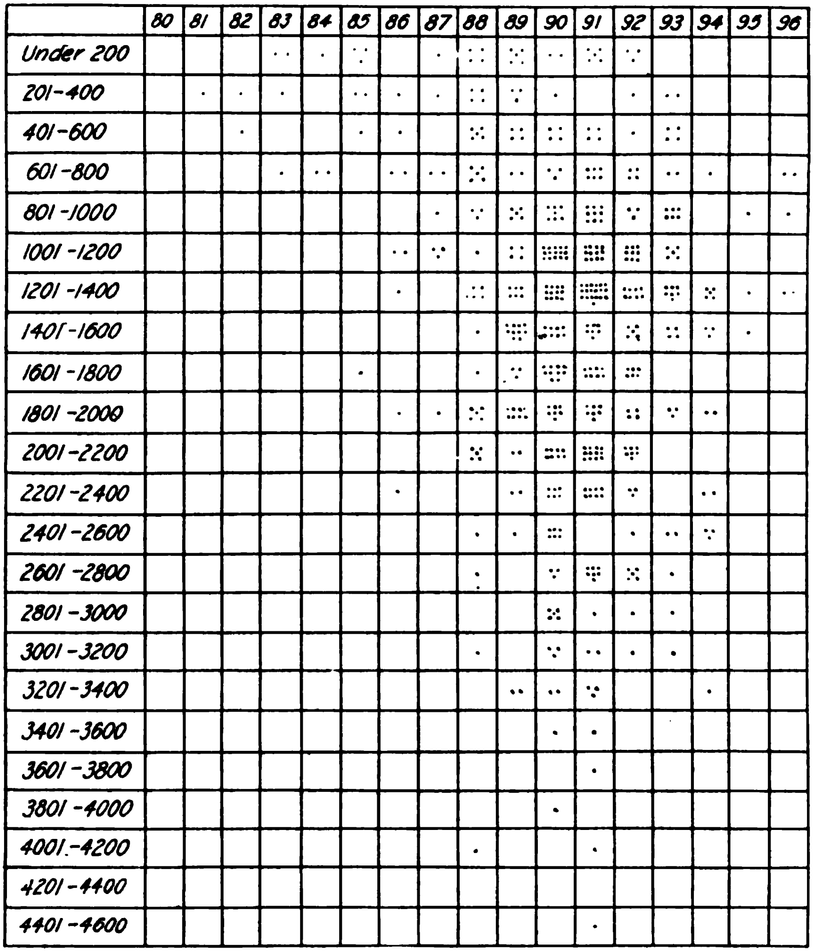

FIG. I. CORRELATION OF ATTENDANCE RATE WITH SIZE OF SCHOOL. (Horizontal scale is for attendance rates; vertical scale is for registers of schools.)

This chart (Figure I) gives a scatter diagram of the 478 schools in New York City to which I have referred. Each dot in the diagram stands for a school whose size is indicated by the line caption and whose attendance rate is indicated by the column caption. The extent to which the dots show a tendency to range from the upper left to the lower right corner of the diagram indicates the extent to which rate of attendance and size of school vary together. I think you can see from the grouping that there is a slight tendency for the dots to arrange themselves in this way.

	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	
Under 200				2	1	3		1	4	5	2	5	3					26
201 - 400		1	1	1		2	1	1	4	3	1		1	2				18
401 - 600.			1			1	1		5	4	4	4	1	4				25
601 - 800				1	2	1	2	2	5	2	3	6	4	2	1		2	33
801 - 1000								1	3	5	7	9	3	6		1	1	36
1001 - 1200							2	3	1	4	15	12	9	5				51
1201 - 1400							1		4	6	12	19	8	7	5	1	2	65
1401 - 1600									1	10	8	7	5	4	3	1		39
1601 - 1800						1			1	3	10	8	6					29
1801 - 2000							1	1	5	8	7	7	4	3	2			38
2001 - 2200									5	2	8	12	7					34
2201 - 2400							1			2	6	8	3		2			22
2401 - 2600									1	1	6		1	2	3			14
2601 - 2800									1		3	7	5	1				17
2801 - 3000											5	1	1	1				8
3001 - 3200									1		3	2	1	1				8
3201 - 3400										2	2	3			1			8
3401 - 3600											1	1						2
3601 - 3800												1						1
3801 - 4000											1							1
4001 - 4200									1			1						2
4201 - 4400																		
4401 - 4600												1						1
		1	2	4	3	8	9	9	42	57	104	114	62	38	17	3	5	478

FIG. II. CORRELATION OF ATTENDANCE RATE WITH SIZE OF SCHOOL. (Horizontal scale is for attendance rates; vertical scale is for registers of schools.)

This chart (Figure II) shows the same facts, except that figures replace dots in the squares. You can see from the totals the distribution of the schools with respect to size. The average size of school is 1,467 pupils. That is, it is in the 1,401 to 1,600 group (indicating). There is no mode or most frequent measure at this group, there being only 39 of the 478 schools whose registers fall between 1,401 and 1,600. From the number of groups (23 in all) and from the frequencies of these groups, you will readily see that the variation in the sizes of schools is great. The average deviation is 652 pupils. The variation in attendance rate, however, is not very great. It ranges from 81 per cent to 96 per cent. The average is 90.3 per cent; and the average deviation is 1.63 per cent.

From this chart the Pearson coefficient of correlation is found to be +0.21, with a probable error of 0.03. Altho the coefficient is low, nevertheless when taken in connection with its low probable error it is significant. The relation, tho small, is direct and it is real.

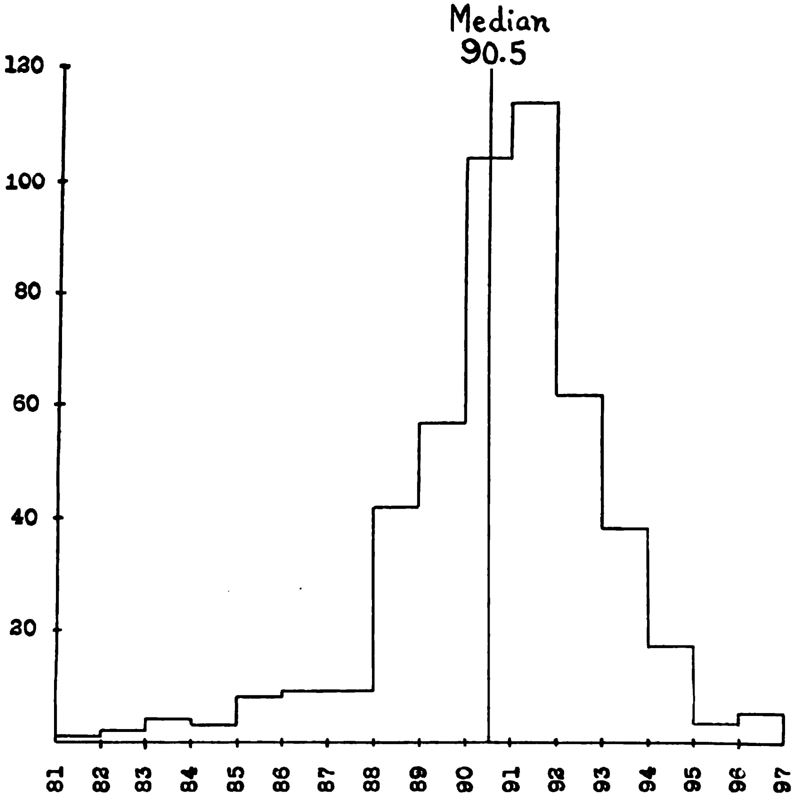

FIG. III. FREQUENCY OF ATTENDANCE RATES (478 schools).

A graphic representation of the distribution of attendance rates among 478 school organizations may be seen in this chart (Figure III). The horizontal scale is for attendance rates. The vertical scale is for the number of schools having the indicated rates. The frequencies rise slowly from a single school at 81 per cent to nine schools at 86 per cent and nine at 87 per cent. It then rises rapidly to a mode at 91 per cent, falling rapidly to three schools at 95 per cent and five schools at 96 per cent. The shape of the frequency surface is approximately normal.

I shall turn now to the second of the series of efficiency indices which I have chosen, namely, the promotion rate.

The reporting of promotion rates by city superintendents has been rather unsatisfactory, and comparison between conditions in the various cities and for various years is quite impossible, owing to the variety of methods employed. Of these methods, two may be mentioned as the most common. By the first method the ratio of the number of pupils promoted on promotion day to the number on register on that day is computed. The method has no justification, except from a statistical point of view. For the one day in question, it meets the requirement of showing the relation of actual to possible conditions. It therefore yields a figure which is valid for that day; but it totally ignores the fact that in well-conducted school systems every day is promotion day, and that an effort is made to advance children whenever they are judged to have reached a point where they can profit by the next higher grade of work. By this method all incidental promotions are neglected; and yet it is one of the surest signs of good school management when the number of these incidental promotions is large. A statistical treatment which leaves them out of account fails to include all the facts.

The second method which is commonly employed in educational reports consists of adding the number of incidental promotions to the number at the end of the term, or year, and dividing this sum by the register on the last day of the term, increased by a number equal to the number of incidental promotions. In other words, it is end-term promotions plus incidental promotions, divided by end-term register plus incidental promotions. There is absolutely no statistical justification for this method. It is true that the first term of the ratio includes all promotions, but the second term certainly does not represent, as it should, all the possible promotions. In fact, it is a figure for which there is no reality.

The method arose from the employment of an intermediate one by which all promotions occurring during and at the end of the term were divided by the register at the end of the term. By this means it frequently happened that the number of promotions was greater than the end-term register, with the result that the rate of promotion was shown to be greater than 100 per cent. It was to avoid this result that the end-term register was increased by the number of incidental promotions. The effect is not always to yield a rate less than 100 per cent, particularly when some of the pupils skip a grade at the end of the term.

The problem, however, will be considerably simplified if we take account of the principle I have stated, namely, that the relation of actual to possible conditions should be shown. In applying this principle the first attempt should be to get a report of the actual conditions. We shall need to know the actual number of promotions made. This is not difficult. But we must bear in mind that we are to show actual conditions in relation to possible conditions. How does the promotion of each child relate to what might possibly have been done? Clearly when a child is promoted, as an actual fact in relation to the best possible result that could have been obtained, it makes a great deal of difference how long he has been on register in the grade concerned. There is a slight theoretical possibility for a child to be promoted after having been a single day in a class (a day being the smallest time-unit we use in school reporting). I have known children to be advanced to the next higher grade after a day in a class. Such an advancement is scarcely a promotion in the usual sense. It hardly takes place except in the case of a newly-admitted child who was wrongly placed at first. But these things happen and they are usually called promotions in the report. My judgment is that, all things considered, they should be. It is impossible to lay down a rule as to how long a time must elapse before an advancement to a higher grade may be reported as a promotion.

It appears, then, that there is, under certain circumstances, a possibility of promotion after a child has belonged to a class one day. This possibility increases as the days go by until it becomes a strong probability for the child who has belonged to the class every day of the term. It is evident, therefore, that there is a sense in which one promotion is not equal to another promotion. The promotion of a child who has been on register two months of a term is not the same as that of a child who has been on register all the term. It is possible and quite practicable to weight each promotion by the number of days that the promoted child has been on the register of the class from which he was promoted. The effect of this I shall show you in a minute.

Meanwhile, obtaining the actual conditions will involve two things: first, the fact of promotion; and, second, the number of days of register for each child promoted.

The method of reporting in every school system should embody short-term reports—say monthly—on which the significant facts for each school may be gathered at the central office for current use. I myself have found these short-term reports to be the best source for making up the usual annual report, by so devising them that the facts required at the end of the year may be accumulated as the monthly reports come in. This method has the advantage not only of keeping data on hand currently, but it has also the added advantage of not requiring principals or teachers to make out annual reports on facts which they have already reported during the year.

Whether such a plan is in operation or not, there may be provided on the form on which the teacher makes daily entries a column or item calling for the number of children promoted from the class each day, and another requiring that, if one or more children are shown as promoted on any given day, the aggregate days of their register in the grade should be shown. The principal can then easily transfer to his report these entries for promoted pupils and aggregate days of register. Thus a statement of actual conditions is given.

The possible conditions, however, are not, in the case of promotions, absolutely definable. By admitting possibilities remote enough, an indefinite number of promotions may be regarded as possible. For a school or a school system the possible conditions may very well be represented for each child by his total days of register in the grade for the term. Advancement from one grade to the next is, from the usual point of view, an indication that the work of the grade from which the advancement takes place has been completed. This means that the child has completed as many days' work as the term contains. If he has been on the register of the grade the entire term and is promoted, his period of belonging and his advancement (measured in days) are the same. If a child was on register less than the number of days in the term, the days should be reported and used in the estimate of possible conditions, for such a child had some chance of promotion and his chance was greater the longer he was on the register. It is one of the greatest weaknesses of the present methods of reporting concerning promotions that no account is taken of the children who dropped out during the term without having been advanced. Any number of these may take place, and the promotion rate will not be affected. I have known of instances where pupils not maintaining themselves were induced to leave school just before the end of the term, in order that the promotion rate might not be diminished by the fact of their being on register at the end of the term.

By the method I am proposing, the promotion rate would equal the aggregate days of register of all promoted pupils divided by the aggregate days of register of all pupils for the grade and period in question. Of course, all pupils transferred from one class to another within the same grade should carry to their new class their days of register in the class (or classes) to which they have previously belonged during the term. An illustration may be given of how this method would register conditions more truly than do the methods now in use. Suppose a class to have consisted of 40 pupils at the beginning of a term of 100 days. Suppose that one pupil dropped out after belonging 10 days; another after belonging 25 days; and a third after belonging 75 days; and that of the remaining 37 all were promoted during the term, no incidental promotions having been made. The register at the end of the term is 37; and the number of promotions is 37. By both the methods commonly used, the promotion rate would be 100 per cent. Observe, however, that this leaves wholly out of account the possibility involved in the three children who were dropped and not promoted. In some way, these should appear in the second term of the ratio. The extent to which they should appear is precisely indicated by the number of days each one of them belonged to the school. The first term of the ratio would be 3,700, the aggregate days of register of the promoted pupils; the second term of the ratio would be 3,700 + 10 + 25 + 75, or 3,810; and the promotion rate would be 97 per cent. I maintain that this is a truer expression of the condition than the 100 per cent rate that the methods now in use would yield.

The fact is worth noting that this method automatically takes care of the puzzling question of what the unit should be in reporting promotions, i.e. whether the unit is the child promoted or the fact of advancement. If a child is advanced two grades either at the same time or successively, does this count as one or as two, in reporting promotions? By the method indicated here, it would count as two, and each successive advancement would show in the report of the grade from which the advancement took place. When a child is promoted two grades at the same time it will be better to regard the child, for record purposes, as for a time (say, one day) in the grade over which he skips. As a matter of fact, double promotions seldom take place, and when they do take place, it is almost always at the close of a term. Under such circumstances, a child has probably been prepared for the double advancement by being instructed in the work of the grade he is about to skip. The time devoted to this advanced instruction may very properly be reported as time in the grade to be skipped.

The usefulness of promotion rates as indices of efficiency may be illustrated from material which came to my hand while I was at New York. I obtained promotion rates of the 478 school organizations for the year 1914-15, and related them to the sizes of schools, as well as to the attendance rates and the rates of overageness. The next chart presents, graphically, the general relation which exists between size of school and promotion rate.* It is evident that large schools are quite as likely to have high promotion rates as are small schools. The average rate of promotion for schools smaller than the average size was 86.8; while that of schools larger than the average size was 88.1.

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*Not shown in this report.

	56-58	59-61	62-64	65-67	68-70	71-73	74-76	77-79	80-82	83-85	86-88	89-91	92-94	95-97	98-100	
Under 200	1		1					2	1	8	7		4	2		26
201-400						1		2	2	6	2	4	1			18
401-600								1	2	5	8	7	1		1	25
601-800							1	1	5	5	5	11	4		1	33
801-1000									5	8	13	5	3	2		36
1001-1200								2	6	7	16	13	7			51
1201-1400									5	13	23	15	7	2		65
1401-1600									3	8	8	13	6	1		39
1601-1800									2	6	9	10	1	1		29
1801-2000									3	8	11	7	7	2		38
2001-2200									2	5	11	10	5	1		34
2201-2400									2	3	5	9	1		2	22
2401-2600										3	4	4	2	1		14
2601-2800									1	3	3	5	3	2		17
2801-3000										2	2	3	1			8
3001-3200											3	2	3			8
3201-3400								2	1		3	1	1			8
3401-3600								1		1						2
3601-3800											1					1
3801-4000													1			1
4001-4200												2				2
4201-4400																
4401-4600												1				1
	1		1			1	1	11	40	91	134	122	58	14	4	478

FIG. IV. CORRELATION OF PROMOTION RATE WITH SIZE OF SCHOOL. (Horizontal scale is for promotion rates; vertical scale is for registers of schools.)

This chart (Figure IV) is a correlation table for promotion rate and size of school. From it, the Pearson coefficient turns out to be +0.17, with a probable error of 0.03. Whatever relationship, therefore, exists between size of school and promotion rate is a direct one, altho it is too small to be of much consequence.

	56-58	59-61	62-64	65-67	68-70	71-73	74-76	77-79	80-82	83-85	86-88	89-91	92-94	95-97	98-100	
80																
81						1										1
82									1	1						2
83								1		1	2					4
84									1	1	1					3
85								1		2		4	1			8
86										3	4	2				9
87									3	1	3	1	1			9
88									5	13	9	10	4	1		42
89	1							2	3	10	16	15	8	2		57
90								1	6	21	39	19	16	2		104
91			1					4	9	17	25	36	17	4	1	114
92							1	2	7	7	22	15	5	2	1	62
93									3	8	7	13	3	2	2	38
94									1	3	4	6	2	1		17
95									1	1			1			3
96										2	2	1				5
	1		1			1	1	11	40	91	134	122	58	14	4	478

FIG. V. CORRELATION OF ATTENDANCE WITH PROMOTION. (Horizontal scale is for promotion rates; vertical scale is for attendance rates.)

An interesting question as to the relation between attendance and promotion arises. A correlation table for these facts is shown on the annexed chart (Figure V); and from it the Pearson coefficient is found to be +0.15; the P.E. is 0.03. Thus it is shown that there is a slight tendency for schools having high rates of attendance to have high rates of promotion also. It may seem surprising that the tendency is not stronger. In fact, I think that most persons would have supposed that the correlation would be much higher than is indicated. As indices of efficiency, however, there is here a relative independence which shows the caution which should be observed in drawing inferences as to the efficiency of organization in a school system from a single feature.

Since the number of children in attendance, in relation to the register of a school, implies little as to the proportion of children promoted, it is obviously necessary to obtain both rates. This shows quite clearly that no single statement may be taken as sufficient indication of desirable organization. The average rate of attendance in the New York schools was, for the year 1914-15, 90.3 per cent. This must be taken, therefore, as indicating nothing more than it pretends to indicate, namely, a certain amount of efficiency in securing the presence of children at school. It implies little or nothing in regard to anything else. It must be taken by itself. The rate of promotion for the New York schools, for the same year, was 88.5 per cent. This figure, likewise, must be taken as indicating nothing more than the extent to which children were advanced in the grades. It is so easy to draw from statistics inferences which are not warranted that this caution is worth emphasizing. In this case, as in so many others, figures must be taken for what they mean, without implications as to anything else, unless the implications themselves have been established.

On the other hand, it must not be assumed that there is any opposition between desirable attendance rates and desirable promotion rates. It is true that the correlation is low, being, as I have said, only +0.15, but the probable error is likewise low, being only 0.03. The coefficient, therefore, is five times the probable error, which is more than enough to establish the existence of relationship. The points to be borne in mind are: First, that favorable attendance conditions do not necessarily imply favorable promotion conditions. Each index is itself independently necessary in the estimate of school organization. Second, there is, on the other hand, no opposition between these characteristics; but there is an unmistakable tendency, discoverable among a large number of schools, for these favorable conditions to be found together.

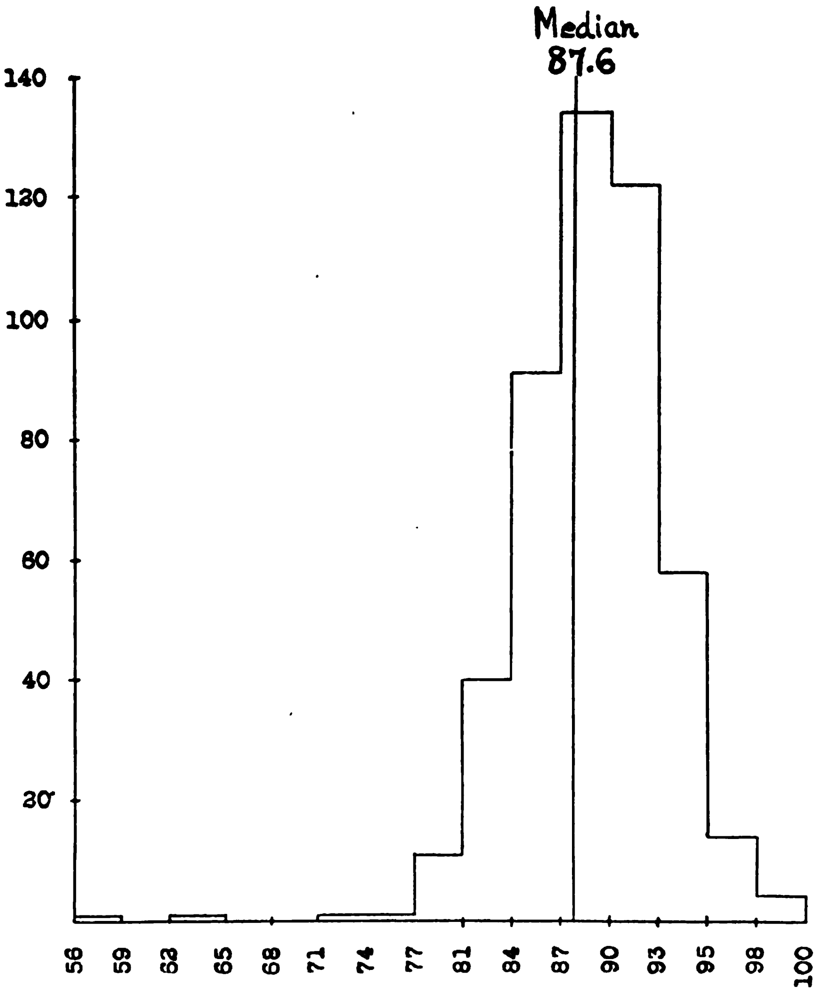

FIG. VI. FREQUENCY OF PROMOTION RATES.

The annexed chart (Figure VI) shows the distribution of schools at New York, according to their rates of promotion. Observe that, with the exception of two schools whose promotion rates were very low, the surface is substantially that of a normal frequency surface of small variability. Observe that the median school has a rate of 87.6 per cent, altho the promotion rate for the city, taken as a whole, was, as I have said, 88.5 per cent.

An examination of the promotion rates as reported for cities in the United States of over 300,000 inhabitants shows that 10 of these cities report promotion rates based on the number of end-term promotions divided by the end-term register. The rates for these cities range from 80.8 per cent for Philadelphia to 93.6 for Seattle. The median condition is represented by New York, at 88.5 per cent, and Boston, at 87.4 per cent. Probably it is a safe statement to make that the promotion rates by the end-term method, for the largest cities of the country, is about 88 per cent. The rate, in general, has been rising steadily ever since it has become a matter of reporting, as is usually the case. About ten years ago the rate was not much, if any, more than 80 per cent. The city superintendents of but four of the cities of this class report promotions based on the register plus incidental promotions. These four cities are Milwaukee, 89.5 per cent; New York, 88.8 per cent; Philadelphia, 85.8 per cent; and Newark, 83.0 per cent. The rate, in general, by this method, is probably about 88.5 per cent.

Passing now to the consideration of the ages of pupils with respect to grade, it may be stated at the outset that this feature of city school reporting is the most recent of those which we have been considering. It was in 1904, that City Superintendent Maxwell of New York made the first systematic beginning of this kind of reporting. At the end of the school year 1903-04, there were registered in the elementary schools of that city 491,674 pupils, and the number of overage pupils was shown to be 192,143, or 39.0 per cent of the registration. The reports of no other city offer so long a period of years over which comparisons may be made with respect to overageness. Beginning in 1904 with 39.0 per cent, the rate of overageness, computed by the method then used, has steadily diminished, until it reached 19.1 per cent in 1915. This means that whereas in 1904 practically 2 children out of 5 were too old for their grades, in 1915 but 1 child in 5 was too old for his grade. In other words, in the period of 11 years, the per cent of overage children has been cut in half. This is, of course, on the assumption that the method of reporting used in 1904 is unchanged. The method used at that time was as follows: The ages of children were taken on June 30—the last day of the school year—after the pupils had been promoted to their new grades. In the first grade, children were called "overage" if they were over 8 years of age; in the second grade if over 9; in the third grade if over 10, etc.

The method in New York, however, has twice been changed, and each time in the direction of adopting a more severe standard.

The last change was introduced in the school year 1914-15, and whereas the rate on the original basis was, as stated, 19.1 per cent, the rate on the new basis for the same pupils was 34.6 per cent. This serves to indicate how inportant it is to define the method of handling the overage question.

Before passing to a description of the present method in use in New York, it may be well to point out that, as in the case of promotion rates, so in the case of the rate of overageness, a marked improvement of conditions follows as soon as the matter becomes one of systematic reporting. No one will suppose that if the attention of principals and superintendents had not thus been called to this matter, the rate of overageness would have been decreased by half in eleven years. I can state positively, of my own experience, that no official pressure was brought to bear upon principals of schools to decrease the amount of overageness, other than the publication of the rates. For the first nine years of the period, the rates were published only for the city and for each of the five boroughs of the city. For the past two years, they have been given for individual schools.

I shall now describe, in some detail, the method which I have used for gathering statistics in regard to the ages of children. A few guiding principles may be stated, as follows:

1. It is desirable to receive the information directly from its source.

2. All tabulations should be made at the central office, under the direction of a person trained for this kind of work.

3. The record of the ages of children should be taken at the time when the problem of adjustment arises and when remedial measures may, therefore, be taken.

4. The standard should be such that children are regarded as overage if they are not in the way of being graduated by the time they reach the age of fifteen.

5. The central office should promptly report to principals and teachers the rates for their schools and classes, and should make available to them all the supporting data.

These principles are, for the sake of clearness, stated in somewhat dogmatic form. The principle of receiving the material directly from its source means that the record of the ages should be taken by the teacher, from the register, as the primary source of the material, and the record should be received at the central office, as made by the teacher. The report for the school will, therefore, consist of as many reports as there are teachers in the school.*

The advantage of receiving the information as made out by the teachers is obvious. Richness of detail is afforded which could not be obtained if the reports were tabulated by the principal for the school and forwarded as a school report. Error in tabulation at the schools is avoided; and in large systems where tabulations would be carried out in many different schools, the amount of this error would be considerable.

The problem of adjustment referred to in the third principle takes place at the time of the reorganization, due to promotion, at the beginning of the term or year. It is at that time that the ages of pupils should be taken. A copy of the class report should be retained by each teacher, for her information. Indeed, most teachers will indicate in their roll-books the fact that a child is overage. Thus this system of reporting not only brings the problem to the attention of teachers at the time classes are organized, but it also enables each teacher to make the precise application of the problem to individual pupils.

The standard set in the fourth principle is called the "up-to-fifteen" standard. Of course, an up-to-fourteen-and-a-half standard, or an up-to-fourteen standard may be used. None of the larger cities in the country are using a standard more rigorous than the "up-to-fifteen" standard. The justification for it lies in the fact that compulsory education laws generally require the attendance of children up to the age of fourteen, and if a child has reached the eighth grade not later than his fourteenth birthday, there is strong likelihood of his remaining until graduation. It is a fact, also, that the elementary school curriculum is devised upon the assumption that children will begin school at 6 years of age and be graduated when they are 14, i.e. before their fifteenth birthday.

The plan which I am suggesting will, therefore, require a report from each teacher at the beginning of each term (or year, if promotion takes place yearly).

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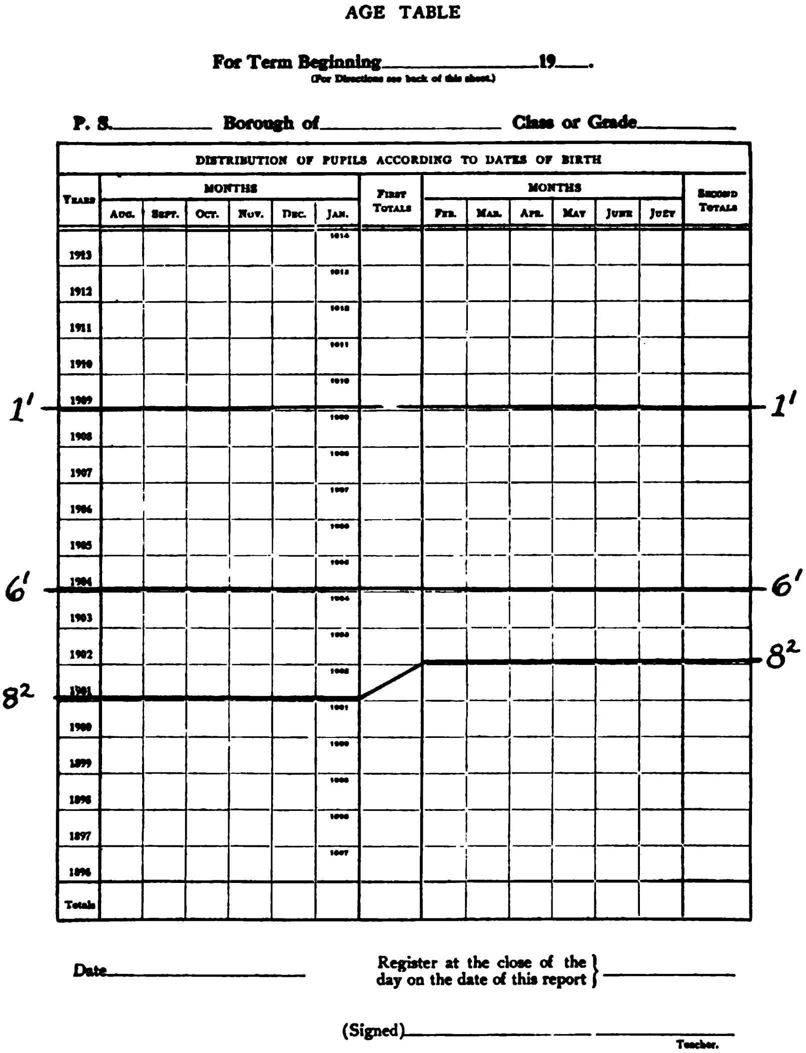
*If more than one grade is taught by a given teacher, the teacher should render a report for each grade in her charge.



AGE TABLE

For Term Beginning____________19___.
(For Directions see back of this sheet.)

P. S.________ Borough of____________ Class or Grade________

DISTRIBUTION OF PUPILS ACCORDING TO DATES OF BIRTH

Years	Months						First Totals	Months						Second Totals
	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.		Feb.	Mar.	Apr.	May	June	July	
1913						1914								
1912						1913								
1911						1912								
1910						1911								
1909						1910								
1908						1909								
1907						1908								
1906						1907								
1905						1906								
1904						1905								
1903						1904								
1902						1903								
1901						1902								
1900						1901								
1899						1900								
1898						1899								
1897						1898								
1896						1897								
Totals														

Date__________ Register at the close of the day on the date of this report }________

(Signed)________________
Teacher.

FIG. VII. AGE TABLE.

This chart (Figure VII) shows the form of report which is being required from the New York City teachers. It represents an evolution, and is itself likely to be changed. The principle, however, is clear. The teachers are not called upon to record the ages of the children, but, rather, their dates of birth. This is a detail which is worth considering. It was adopted because teachers' roll-books showed dates of birth, instead of ages. I found that a form of report calling for the ages of pupils introduced a great deal of error, due to the fact that teachers cannot, with anything approaching uniform accuracy, subtract the date of birth of a child from a given date at the end of the term. Accordingly, all that is required on the blank shown in this chart (Figure VII) is that a teacher enter a score-mark for each pupil opposite the year and under the month of his birth, the days of the month being neglected. After entering the score-marks for the dates of birth of pupils these are counted and entered in the columns headed "First Totals" and "Second Totals". For the purpose of checking the work, vertical totals are also entered, and the footings of the first totals and second totals taken together should equal the register at the close of the day on the date of the report.

You will notice that first and second totals are called for. The reason for this is that by so doing the number of pupils born within each of the two six-months' periods corresponding to the half-years of school may be shown for any year. Since the calendar year does not correspond to the school year, the matter of gathering the numbers of children born in the different months is not as simple as it might at first appear, unless we are willing to re-group the children at the central office and to lose the natural grouping which this table affords. Permit me to show you what I mean by the "natural grouping". Suppose this blank to have been made out for the second half of the present school year, and suppose, further, that it has been made out by a teacher of the first half of the first grade. Altho the report will have been made out at the beginning of the term, which, in New York, would be February first, the ages, as I have just stated, are to be computed to the end of the school year, i.e. to July 31. Therefore, what we wish to know is the number of pupils who will be over 7½ years of age by July 31, 1916. All such pupils are overage in the first half of the first grade. Pupils will be 7½ years of age, or older, on July 31, 1916, if they were born on or before January 31, 1909. If a teacher of a class in the lower first grade, after scoring the ages of her pupils on this blank, draws a line straight across here (indicating the line between 1908 and 1909), all the pupils whose ages are scored below the line will be overage, and all those scored above the line will be at age or younger. If she draws a line here (indicating the line between 1909 and 1910), she will inclose all the children in her class who are of normal age, adopting 6½ to 7½ as being normal. In the same way, a teacher of any grade may, after scoring the ages of the pupils, mark off those who are overage, those who are normal, and those who are underage. In the form as used at New York, information is given on the back to show how this may be done.

There is an added advantage in having the dates of birth rather than the ages of children made the basis of the reporting. When ages are to be reported and the teacher works from dates of birth, she has to make thirty or forty subtractions in filling out the report. When the dates of birth are directly reported, all children who were born, say, in August, 1908, of whom there may be hundreds or thousands, are recorded as to their ages, by a single subtraction, thereby enormously reducing the amount of labor involved. The principle of calculating ages to the end of the term stresses the problem to be met, namely, the completion of the elementary school course before the fifteenth birthday, or the completion of any grade of work before the age corresponding to the grade. We therefore desire to secure the ages of pupils at the end of the term or year while taking the count at the beginning of it. This is not usually done, but it presents no difficulty, and it has at least one advantage which has not been mentioned. It automatically takes account of pupils who drop out during the term.

It has been a matter of criticism, in City Superintendent Maxwell's reporting on age conditions, that he did not show the ages of the "thousands of children" who were dropped from the register during the year. By taking the count at the beginning of the term, all such pupils are recorded. This method was followed last year. The result, however, indicated that there was no bias to be inferred from the fact that in former years pupils who left school had been omitted from the count. It will readily occur to you that by taking the count at the beginning of the term we are out of the frying-pan and into the fire, because, while including those who drop out, we exclude those who are admitted subsequent to the beginning of the term or year. With a view to testing the extent to which the reporting of new admissions was worth while, I provided, last year, that the teachers should retain a copy of the report forwarded to the city superintendent at the beginning of the term, and that for all new admissions after the report was made out, the ages should be scored in red. At the end of the term, a copy of the teacher's retained blank, with the original and red scorings, was forwarded to the city superintendent's office. This is a detail which can easily be provided, if anyone cares to do so. I did not find last year that the method of reporting the ages of new admissions yielded significant data. There is apparently no material difference between the age groupings of the admitted pupils and of the pupils on register at the beginning of the term.

Permit me to dwell for a moment upon an advantage which follows from this method of gathering information in regard to the ages of children in respect to grade. I have suggested that by getting the reports directly from the teachers, a richness of detail is possible which is lost when the reports are summarized at the schools. No system of reporting with which I am familiar divides the ages of children into any finer steps than half-years. This blank permits the tabulation of the ages of children by years and months. Probably in most cases it will not be found advisable to tabulate—much less to print—the ages of children as accurately as this, but, for many purposes—particularly for the principal at the school and the class teacher—it is exceedingly important to know just how much the children are above normal age. It is always found, when age-grade statistics are reported, that the largest group among the overage children is the group next older than the upper limit of normal age. For instance, if in the last half of the sixth grade the normal age is 13 years, and ages are being reported on the half-yearly basis, it will be found that the largest half-yearly group of children older than 13 is the group whose ages are between 13 and 13½. Similarly, when the ages of children are found in years and months, a very large group of children—often the largest—will be found to be one month, or less, above normal age. The treatment of these children will doubtless be different from that of children who are much older than the normal age. The majority of them can probably be advanced an extra grade, by special effort, without lowering the standard for promotion. They would thus become of normal age for their new grade. The thought which I wish to bring out is that frequencies within the group "Overage Children" are greatest near the normal group, and that these are exactly the children who will probably most readily respond to special treatment.

The efficiency index which I propose in this connection I shall call the "age rate". It is the ratio of the number of normal and younger children to the register at the time of taking the count. You will see that it is again an application of our principle of expressing the ratio of actual to possible conditions. It is more usual to express the compliment of this rate, namely, the rate of overageness. I have chosen to use the rate of normal or younger children, because the rates then present the same form as do those of attendance and promotion, where, in all cases, 100 per cent means perfection.

We shall now inquire into the relation between the age-grade rate and some of the other factors which we are considering.

	36-38	39-41	42-44	45-47	48-50	51-53	54-56	57-59	60-62	63-65	66-68	69-71	72-74	75-77	78-80	81-83	84-86	87-89	90-92	93-95	96-98	
Under 200	1			1		2			3	2	3	2	3	6		1	1	1				26
201-400	1					1	2	2	4	1	3		1	1			1					17
401-600					1	1		1	1	3	6	1	8	1	1	1						25
601-800				2		1	2	4	2	4	7	3	3	1	3	1						33
801-1000						2	3	3	8	7	3	3	4	1			2					36
1001-1200				1	1	4	2	6	7	9	7	4	6	1	1	1						50
1201-1400				1		1	9	8	13	8	8	5	3	4	3	1					1	65
1401-1600					2	2	2	3	5	3	7	6	5	2	1							38
1601-1800						2		4	4	3	10	2	2	2								29
1801-2000						2	3	4	4	3	10	5	5		1							37
2001-2200						2	2	3	2	6	8	6	3	1		1						34
2201-2400							2	1	2	5	2	6	1	1	1		1					22
2401-2600				2		1		1	1	2	2	3	1	1								14
2601-2800						1		4	2	1	3	2	3				1					17
2801-3000						1		1	2	2			1		1							8
3001-3200								2			3	2	1									8
3201-3400									1	2	2	2	1									8
3401-3600									1	1												2
3601-3800													1									1
3801-4000														1								1
4001-4200														2								2
4201-4400																						
4401-4600													1									1
	2			7	4	23	27	47	62	62	84	52	53	25	12	6	6	1			1	474

FIG. VIII. CORRELATION OF AGE RATE WITH SIZE OF SCHOOL. (Horizontal scale is for age rates; vertical scale is for registers of schools.)

This chart (Figure VIII) is a correlation table, the horizontal scale of which represents age rates, and the vertical scale of which represents sizes of schools. You can see from the position of the figures that there is little, if any, of that trend from upper left to lower right, which would imply a direct correlation. As a matter of fact, the correlation is +0.03, with a probable error of

0.03. The coefficient, therefore, is not only very low, but it is no larger than its probable error. In this instance, even more than in the case of attendance and promotion, the fact that a school is large, or medium, or small has no bearing.

	36-38	39-41	42-44	45-47	48-50	51-53	54-56	57-59	60-62	63-65	66-68	69-71	72-74	75-77	78-80	81-83	84-86	87-89	90-92	93-95	96-98	
80																						
81													1									1
82											1		1									2
83						1				1				2								4
84											1		1	1								3
85						1		1			2		1			1	2					8
86							3		1	2	2	1										9
87						1	2		1		2	1	1	1								9
88				1		5		6	8	1	7	2	5	5	1							41
89				1		2	3	4	4	9	9	7	7	5	3	1	1	1				57
90				2		2	4	13	11	13	22	15	16	1	4		1					104
91	1				1	2	5	7	20	20	23	9	12	7	3	1	1				1	113
92	1				1	6	2	7	5	10	9	11	4	1		2	1					60
93				1	1		3	6	8	5	5	3	3	2		1						38
94						2	4	1	4	1		3	1		1							17
95				1	1			1														3
96				1		1	1	1			1											5
	2			7	4	23	27	47	62	62	84	52	53	25	12	6	6	1			1	474

FIG. IX. CORRELATION OF AGE RATE WITH ATTENDANCE RATE. (Horizontal scale is for age rates; vertical scale is for attendance rates.)

The next chart (Figure IX) shows the relation between age rates and attendance rates in the 474 elementary school organizations at New York City for which age and attendance figures were available. You will observe that not only is the trend from upper left to lower right absent from the diagram, but that there even appears to be a trend from the upper right to the lower left, indicating an inverse correlation. As a matter of fact, the Pearson coefficient is −0.17, with a probable error of 0.03. This inverse correlation may be surprising. It is true that it is not large; altho when taken in relation to the small probable error, it cannot be neglected. It is never safe to argue about causation from coefficients of correlation. It would be absurd to suppose that a high attendance rate caused overageness, or that a large amount of overageness was a cause of high attendance rates. However, that high attendance rates and low age-grade rates may exist together in the same schools is abundantly shown by this table. It is probable that all that it means is that older pupils attend school more regularly than do younger pupils.

	36-38	39-41	42-44	45-47	48-50	51-53	54-56	57-59	60-62	63-65	66-68	69-71	72-74	75-77	78-80	81-83	84-86	87-89	90-92	93-95	96-98	
56-58										1												1
59-61																						
62-64	1																					1
65-67																						
68-70																						
71-73													1									1
74-76										1												1
77-79						3	1	1	2	1	1	1		1								11
80-82					1	3	5	6	9	6	4	2	1	1	2							40
83-85				2		10	10	13	16	10	9	11	4	2	1	1	1					90
86-88	1			3	1	6	7	16	12	22	25	15	14	6	3		1				1	133
89-91				1			1	7	20	13	28	16	19	7	4	3	2					121
92-94					2	1	2	4	3	7	14	6	12	4	1	2						58
95-97							1			1	2	1	2	3	1		1	1				13
98-100				1							1			1			1					4
	2			7	4	23	27	47	62	62	84	52	53	25	12	6	6	1				474

FIG. X. CORRELATION OF AGE RATE WITH PROMOTION RATE. (Horizontal scale is for age rates; vertical scale is for promotion rates.)

This chart (Figure X) shows the relation between age rates and promotion rates for 474 schools in New York last year. There is here a positive correlation of 0.22, with a probable error of 0.03. This direct relationship, altho the r-value is not large, is significant when taken in connection with the fact that it is more than seven times its probable error. It is doubtless true that, in general, schools having high promotion rates show, likewise, good conditions in respect to the ages of pupils.

This chart (Figure XI) shows the distribution of 474 schools according to the per cent of children at age or younger. Two schools have very low rates, and one school has an abnormally high rate. The rest of the schools distribute themselves in an approximately normal way about the median, which is at 66.7.

In all three of these indices—attendance, promotion, and age rates—there is no such close relationship between any two of them that one may be inferred from another. It is evident that there is no indirect measurement of age conditions when promotion rates are known. Likewise, there is no indirect measure of promotion to be derived from attendance. If we wish to know the status of a school with respect to any of these facts, we shall have to express each of them independently. That is why they are valuable indices of efficiency worthy to be considered and reported separately.

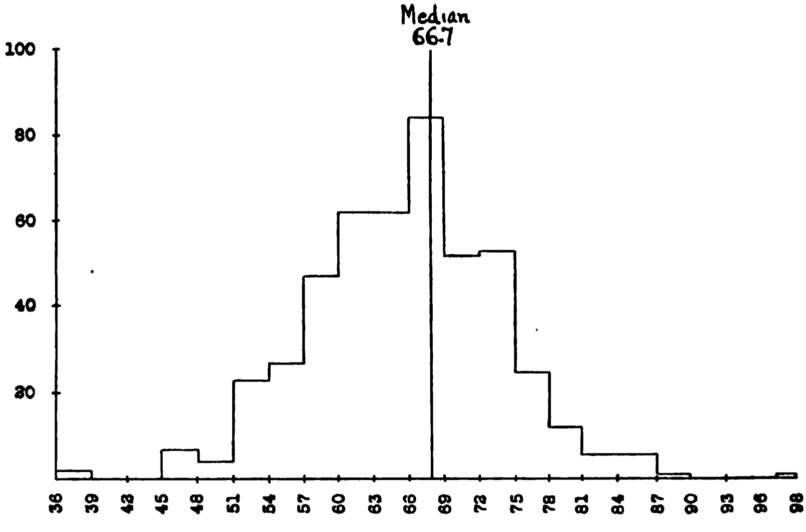


FIG. XI. FREQUENCY OF AGE RATES.

I have suggested, in the beginning, the consideration, likewise, of economy both in respect to organization and to cost. Both these matters deserve much fuller treatment than I can give them here. An index of the economy of organization may be found in the average size of class, or ratio of the number of pupils to the number of teachers employed. Last year considerable work was done on this problem at New York, and no work was used more effectively in promoting closeness of organization. Three times a year an analysis was made of the number of classes of different sizes, and of the number of pupils enrolled in these classes. By this means the department was able to check up the number of unduly large classes and to divide them, and it was also able to check up the number of unduly small classes and to combine them. I do not feel that I ought to take your time in entering into this phase of the question of economy. I should, however, like to ask your attention to one matter which I consider especially important.

As an index of economy, the cost of instruction per pupil per hour may be used. This was computed last year at New York by a method which I shall take a few minutes to explain The cost of instruction is taken to include (1) the cost of teachers' salaries, and (2) the cost of educational supplies, including test-books, stationery, and all supplies necessary for the instruction of children. In other words, I am excluding the items of school expenditure which do not vary closely with the number of pupils receiving instruction. I obtained from each school, as a matter of regular reporting, the aggregate daily register of each class. This aggregate register was multiplied by the number of hours of instruction per day which the class received. These aggregates were combined, for schools and for the entire city, thus furnishing the aggregate number of hours of instruction which the elementary schools of the city gave to pupils during the school year. This aggregate reached the enormous total of 617,767,110. Observe that altho I call these the aggregate hours of instruction, they are really the aggregate hours of register. In other words, I am using the register rather than the attendance as the basis for computing cost.

A few words may not be amiss as to the propriety of using the register rather than the attendance of pupils as the basis for computing the unit cost of instruction. In the first place, expenditures for teachers' salaries are adjusted to register rather than to attendance. The number of teachers required in any given school is determined on the basis of register rather than of attendance. Requests for increase and decrease of classes are supported by evidence as to the registers of classes. The creation of special classes and of classes for defective children is again based upon the number of children who will belong to the classes, rather than upon an attempt to determine those who will actually attend them. Of course, the number of attendants is considered to be a rough approximation of the number belonging, but, so far as the two numbers differ, it is the latter rather than the former which determines the need for the class.

In the second place, expenditures for textbooks and supplies, wherever these are furnished by the board of education, are based upon register. Allotments of money for the ensuing year, are made to principals of schools, on the basis of the number of children belonging to the school, i.e. upon the register, and not upon the attendance. If a principal makes application for an additional appropriation, the supporting data are again those of register; he shows an increase in the number of children who belong to his school, over the number upon which the original appropriation was based.

It has been argued that the estimate of instruction, when based upon attendance, constitutes "solid service". The argument respecting "solid service" is a fallacy drawn, in all probability, from the industries, where, in a different sense, it plays an important part. The analogy, however, does not apply to the schools. The attendance or absence of employees in a factory is indeed determinative of output, and the cost per operative must surely leave out of account the operatives who are absent. This might, indeed, furnish an analogy for application to teachers, but it can form no proper combination as applied to pupils. They are not employees, nor do considerations applicable to employees apply to them. If we must use factory terms in our educational vocabulary, we may say that the pupils represent the raw material, and that the product is the refinement of this material. And the peculiarity about the raw material is that whether it is physically present or absent, it is always present in the sense that it always belongs to the work of the school, and that it is always to be refined.

The service which is based upon attendance is indeed "solid", but it is only a fraction of the total instructional service rendered. Far the greater part of the aggregate absence of pupils is an accumulation of many short periods of absence, due to temporary causes. There is in most cities, and there ought to be in all of them, provision for the discharge from the register of pupils who are required, for proper reasons, to be absent for longer than a prescribed period. Pupils who are absent for insufficient reasons are being reached more and more effectively every year, thru the compulsory education service. What justification, therefore, that there might have been in the past for basing instruction upon attendance—a justification due to the fact that the register was a variable quantity—appears to be becoming of less force as the school business becomes more definitely organized and school laws become more adequately enforced.

The estimate of the amount of instruction, as based upon attendance, has, I believe, been foisted upon the educational world by business men who failed to make the proper distinction between cost accounting in business and cost accounting in education. No school man would conduct an educational system on any other basis than that the teachers are responsible for the instruction of all pupils belonging to their classes. Promotion rates are based upon the ratio of pupils advanced to pupils on register. The number in attendance is disregarded. The instruction is for all, and the service is rendered to all. Textbooks and supplies—an important element in cost of instruction—are likewise issued, in general, to all pupils who are registered. Each child has his own textbooks and material. If he is absent, he either has his books at home, or they are left at the school. In either case, it is not practicable to issue them to another pupil. The loss, damage, and waste incident to a divided responsibility for them could not be justified.

Finally, the service based upon attendance is not "solid" even in the sense in which those who use it appear to think it is. The reporting of attendance is, in all localities with which I am familiar, based upon the assumption that a child present part of the day is to be reported as in attendance for that day. Thus the basing of cost upon attendance admits a margin of error, due to the fact that thousands of children every day attend school only a portion of the time devoted to instruction for their classes. A great many attend in the morning who are absent in the afternoon. Others are present in the afternoon and not present in the morning. Still others are excused during either the morning or the afternoon session. The minute we try to base cost upon attendance, we are confronted by such perplexing problems as these. For legal purposes, fractions of days may be counted as whole days; but if we are to estimate the amount of "solid service" as based upon attendance, we shall be obliged to introduce refinements of reporting attendance which would be burdensome and intricate. There can, however, be no doubt as to the length of time during which it is proper to say that a child belongs to the school, that is, there can be no doubt as to the number of days that he is on the register.

I cannot give you the cost of instruction per pupil hour on this basis for any other city than New York. The following facts, however, were true for that city for the school year 1914-15: For elementary schools, exclusive of kindergartens, the aggregate hours of register were, in round numbers, 618,000,000; the cost of the salaries of principals and teachers was $23,500,000; and the cost of supplies $1,390,000, giving a total cost of instruction, defined as above, of a trifle less than $25,000,000. On these bases, the cost of salaries for each hour a pupil was registered was $.038; the cost of educational supplies was $.002¼; making the instructional cost almost exactly $.04. For kindergartens, the aggregate hours of register were more than 18,000,000, and the cost of instruction (salaries and supplies) was a little less than $1,000,000. Accordingly, the cost of instruction was $.053 per pupil per hour for kindergartens. For elementary schools, including kindergartens, the cost of salaries was $.0383; the cost of supplies was $.002¼; and the cost of instruction $.0405.

The cost of instruction per pupil per hour, in elementary schools at New York, has also been computed on the basis of attendance. It is interesting to note the difference between this cost and similar cost on the basis of register. In the Annual Financial and Statistical Report of the Bureau of Audit and Accounts for the New York Department of Education, the cost per pupil per hour is given for 1914, on the basis of attendance, as $.04564. That is to say, the cost on register is almost exactly 4 cents an hour for each pupil, while that on attendance is more than 4½ cents. This difference of ½ a cent per pupil hour, it is maintained, represents a true statement of the cost of extension of educational service to pupils belonging to the schools during such time as they are not in attendance. It is precisely our contention that the service is, in fact, extended to such pupils, and that, accordingly, the cost of instruction for each pupil during every hour that he is a member of a school is properly the figure to be used and reported.

A Survey of the Gary Schools and the Pre-Vocational Schools in New York City

B. R. Buckingham

During the school year 1914-15 Superintendent Wirt of Gary, Ind., was retained by the Board of Estimate of New York City, and he organized during that year two schools on the Work-Study-and-Play plan. During the same year, there were organized by Associate Superintendent Ettinger of New York City six schools with a pre-vocational course of study. This course of study affected only the seventh and eighth grades.

City Superintendent Maxwell asked me to make a study of these two types of experimental schools with a view of ascertaining the success which they had in the instruction of their students in some of the regular academic subjects. It was his thought, and it is also mine, that no matter how people may differ as to their educational creeds, no matter how they may vary in their conception of how the elementary schools should be organized, no matter how wide a variation there may be in courses of study, there are, nevertheless, some subjects so fundamental, and there are some parts of these subjects so fundamental that ignorance of them is a misfortune, and instruction in them is an imperative necessity. The State, in extending universal education to the children of its citizens contemplates that they shall be informed concerning some fundamental matters, and whether the organization of the school be called by one name or another, we cannot regard an organization as successful unless it offers sufficient instruction in these fundamentals.

The report which I gave you yesterday was a by-product of this survey of the experimental schools in the City of New York. As you will remember, the subjects in which the children were tested were arithmetic, spelling, geography, history, and English grammar—all applied to the seventh and eighth grades. I may state general conclusions at the outset. The regular schools showed the greatest amount of improvement. The pre-vocational schools were next, and the Gary schools were last. This is a statement drawn from an enormous amount of detail.

It is only true as a general statement. There were many details in which the order of improvement was not as I have stated it.

These tests were designed to be tests of equal difficulty, and no small effort was expended to make them so. Question 1 of the March test, say in arithmetic, was, by a considerable amount of testing carried on thruout the country, determined to be of equal difficulty with question 1 of the June test; and question 2 of the March test was likewise a parallel question in point of difficulty with question 2 of the June test; and so on for the entire series. Since the elements composing the test were each equal in point of difficulty to a corresponding element in the second test, the tests themselves as total instruments of measurement might be said to be of equal difficulty. The actual questions are the ones I distributed to you yesterday morning.

First, the improvement in arithmetic, as measured by the per cent of pupils who did better in June than they did in March, was as follows: For the Gary schools, 40.7 per cent; for the pre-vocational schools, 47.6 per cent; and for the regular schools, 54.3 per cent. The rank of the different types of schools, therefore, was: regular schools first, pre-vocational schools second, and Gary schools third.

Second, in spelling the proportion of children who did better in the June test than in the March test was as follows: In the Gary schools, 52.8 per cent; in the pre-vocational schools, 63.7 per cent; and in the regular schools, 63.0 per cent. You will see, therefore, that the serial order was pre-vocational schools first, regular schools second, and Gary schools third,—a rather poor third.

Third, in geography, by the same system of parallel testing, the proportion of children who showed improvement in June was: For the Gary school, 58 per cent; for the pre-vocational schools, 53.4 per cent; and for the regular schools, 57.7 per cent. The serial order was: first the Gary schools, second the regular schools, and third the pre-vocational schools.

Fourth, in history the percentages of improvement were as follows: For the Gary schools 72.3, for the pre-vocational schools 67.2, and for the regular schools 63.2. The order, therefore, was: Gary schools first, pre-vocational schools second, and regular schools third.

Finally, in English grammar the improvement was: For the Gary schools 58.8 per cent of the pupils, for the pre-vocational schools 65.8 per cent, and for the regular schools 62.9 per cent. The serial order, therefore, was: Pre-vocational schools first, regular schools second, and Gary schools third. The Gary schools, on this basis of showing improvement, were third in arithmetic, third in spelling, first in geography, first in history, and third in English grammar. What I have just given you, bear in mind, is the proportion of children who showed improvement.

I have also estimated the improvement on the basis of the difference between the number of questions answered correctly in March and in June. If it is thought that the first basis for estimating improvement is objectionable, it will be thought so on the ground, in the main, that a child may show very large improvement and there will be no more credit indicated than there would be for a child whose improvement was very small—that they are all counted, if they showed any improvement, simply as being so many children who improved. But for large numbers of children, those of you who are familiar with the behavior of figures drawn from abundant sources, will realize that, while this is a discrepancy which might come out for small groups of people, it would not when large groups were concerned; and this is borne out, in this study, by the fact that when improvement is shown on the basis of the difference between the number of questions answered correctly in March and in June, there is no change for any subject in the ranking of the three types of schools. On the second basis of improvement, if, in the Gary schools, on the average, 4½ questions had been answered correctly by each child in March, and if in the parallel test in June five questions, on the average, were answered correctly, then the improvement would be half a question. As I say, on this basis there is no difference in the character of the showing.

Thirdly, I showed the improvement on the basis of the relation between the actual and the possible improvement. In any given class, if one child is rated 40 per cent and another is rated 80 per cent, and if the improvement of each child is 10 per cent, making one of them 50 and the other 90, we are likely to feel that this is not to be interpreted as meaning that they both improved to the same extent. It is much harder for the child who is already 80 per cent to improve at all. The possibility of improvement is very much diminished.

Now, the child who was at 40 per cent and who added 10 per cent to his rating, would improve only one-sixth of his possible improvement, that is, one-sixth of the distance from 40 per cent to 100 per cent. His increase of 10 per cent would, therefore, mean 16⅔ per cent of his possible improvement. On the other hand, the child who began at 80 and advanced to 90 would improve 10 per cent where it was possible to improve 20 per cent. His increase, therefore, in relation to his possible increase would be one-half or 50 per cent.

I calculated the improvement for the different types of schools on this basis, and there was substantially no change except for the fact that the showing was somewhat more favorable to the regular schools, due to the fact that their ratings were, in general, higher to begin with. Accordingly, their improvement from the higher initial ratings counted more when one took it in relation to what their improvement could have been. The serial order for each of the subjects was only changed in the case of geography, where instead of the Gary schools being first by a small amount, the regular schools were first by a small amount.

When I sought an answer to the general question as to which type of school showed greatest, next greatest, and least improvement I first combined the scores for each of the subjects into one general score for all subjects taken together. The result was, as I said in the beginning, that the regular schools were first, the prevocational schools second, and the Gary schools third. By the first method (per cent of children who improved) the ranking was indicated by the figures 60, 59½, and 56. By the second method (difference between initial and final scores) the ranking was indicated by the figures 7.5, 7.3, and 5.6. By the third method (ratio of actual to possible improvement) the figures were 14.4, 13.3, and 9.7.

In the statements I have just made the assumption has been that one subject is equal to another. Now, we all know that this isn't true. No one would suppose that spelling was as important as arithmetic, not but that it may be socially as important—that isn't what I mean—but elementary schools don't spend as much time on it; it doesn't bulk as large in the total activity of the school as does arithmetic. Similarly, English grammar is of relatively less importance, on the basis of the time cost in the curriculum, than geography. Accordingly, I weighted these subjects, taking account of the time spent in the study of each of them in the elementary schools. This had the effect of giving considerably more advantage to the regular schools than was given to them when each subject was counted as of equal importance. This was due to the fact that the one subject of the five to which the greatest amount of school time is devoted, namely, arithmetic, is exactly the subject in which the regular schools showed the greatest amount of superiority over the other two types. But upon any showing, whether it is the per cent of children who improve, or the difference between the number of questions they answered correctly, or the ratio of the actual to the possible improvement, or whether it be with subjects counted as of equal weight, or with subjects counted as weighted by the time spent upon them—in all cases, when the matter is boiled down to a general statement, the order of improvement is invariably the same.

Now, the method that I have followed in this report has been vigorously attacked. I haven't answered any of the criticisms, and I have no present intention of doing so. If it should come to the point where persons competent to judge an inquiry of this kind and willing to assume a reasonably detached point of view questioned the workmanship or pointed out instances where the interpretation of the data was erroneous or misleading, I might have something to say. Meanwhile, however, you should realize that in order to make the report understood by those for whom it was intended, it was necessary for me to avoid being lost in the great detail out of which the general conclusions arose. Anyone who wants to make a case wants the details, and a person can make out almost any kind of a case he likes from the details if he confines himself, either exclusively or generally, to those details that help the cause he wants to advocate.

If he is a bungler he will confine himself to such details exclusively; if he is artful he will include enough details of the opposite kind to give himself the appearance of candor. I have seen some very curious statements drawn from my own report, statements that are quite erroneous; and as long as they are, I feel quite sure that I can leave to competent people a judgment between the critics and myself.

It is true that the Gary schools had not been long organized, and it would have been outrageous if I had given them one test and drawn any conclusions from it, but I gave them two, and I drew no inference whatever from the first test, but only from the difference which was shown as between the first and the second. Now if the Gary schools in process of reorganization were discriminated against in the first test, it would be supposed that their situation three months later would be very much improved. They would be like a person who, due to some physical illness of the moment, performs below form, and then at a later time on a similar test, say of strength or intellectual ability, shows a marked improvement. That is the situation in which it seems to me the newly organized schools were. The very fact that they were in a disadvantageous condition at the time of the first test would operate to give them an unusual opportunity to show improvement between that and the second test.

If it is objected that the Gary schools were not really Gary schools and that conclusions about them should not be used as conclusions about the Gary system, I shall reply that I have nowhere applied them to the Gary system. The conclusions are true and valid for the schools investigated. What application others may give them on the basis of the schools being typical will be for them to justify. The following citation from the report will indicate my own attitude:*

"In all fairness some caution should be exercised in drawing from the data of this report inferences unfavorable to the Gary schools. We may properly remind ourselves that their educational philosophy is not that of the traditional schools, and that it is truer and more vital than any philosophy which the traditional schools usually put into practice. We ought also to remember that we are comparing two types of schools as to matters which one of them emphasizes and which the other does not. . . . The modern social philospohy, the philosophy of John Dewey and his school, is too profoundly true to be belittled by any one. In so far as Superintendent Wirt is actuated by that philosophy he should be given profoundly respectful attention. It appears not only that he is so actuated, but that he is one of the few persons who have consciously and systematically attempted to work over his theories into practice. Opinions as to his success in this most difficult task of translating theory into practice will vary between the opinions of those who blindly accept and seek to transplant them, and the opinions of those who, with equal blindness, reject them entirely.

"Meanwhile, however, it is entirely proper to seek to appraise the work of the schools conducted on the Gary plan. Superintendent Wirt has never objected to this. In fact, he has welcomed every attempt to survey the schools at Gary and is now planning to coöperate with the General Education Board for a systematic investigation of them. To accuse any one, therefore, of lack of sympathy with the Gary plan because he seeks to evaluate it, is to accuse Superintendent Wirt himself.

***Seventeenth Annual Report of the City Superintendent of Schools*, 1914-15, p. 57.

"If, then, we wish to appraise the work of the Gary schools we must suspend judgment concerning them until the appraisal has been made. We must give them abundant opportunity to justify themselves, and we must give them an attentive, sympathetic hearing. We must be judges and not partisans; neither so radical that the lessons of the past mean nothing to us, nor so conservative that our faces are not turned toward the light. In maintaining the judicial attitude we should insist that the Gary plan be set up only so far as favorable experimental conditions require. The evidence afforded by this report is unfavorable to the defendant. It shows that claims made have not, in these particular schools, been substantiated. It makes clear that in matters regarded by the State as constituting essential parts of an elementary education, these schools have been unable to advance as many of their pupils within a given time as have the schools offering the regular course of study."

Cost of Instruction in Indiana High Schools, and Related Topics

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UNTIL recently very little has been done in the administration of American school systems but to follow the lines of tradition and opinion, and some still work on this basis, as attested by a questionnaire received recently from the superintendent of one of our large eastern school systems, who wished to ascertain the opinions of superintendents and college professors regarding their estimate of the value of certain school methods. In reply an expression of opinion was given with this addition: "Why do you ask the opinions of superintendents and professors who know no more about it than you do? You have 30,000 or 40,000 children in your schools. Why not select twenty or thirty teachers in the grades in question, divide them into two equivalent groups, and have each group try out one of the two methods for a year, collect and tabulate data, and determine your future method by the findings?"

The American public high school has developed so rapidly in the past quarter of a century and has taken such hold upon popular imagination that it has been possible for the superintendents to ask for almost anything in the way of financial assistance and get it. The great increase in attendance and teaching staff and the increasing cost and variety of studies and of equipment have well-nigh brought us to the limit of our resources. It has now reached a point where the superintendent or principal who wishes to develop a new and important addition to his high school activities must be able to effect economies in his present practice, and to do this he must have definite standards of organization as a basis for convincing argument. More and more the school administrator is becoming an educational and business expert. Fifteen years ago no superintendent knew what per cent of his pupils were accelerated, normal, or retarded, but five or six years of careful investigation of the problem has made this one of the standard items of school administration, and has had wide influence in establishing departmental work and in breaking down the lockstep in educational advancement, and incidentally in reducing the cost of repeaters. Ten years ago scarcely a superintendent could tell the cost per capita for instruction in the elementary or high school.

In 1912 Superintendent Spaulding, of Newton, Mass., did pioneer work in determining the cost of instruction in the different high school subjects in each of his three high schools, for the purpose of reorganizing his courses and administrative procedure. Two years ago one of my graduate students worked out a master's thesis on this problem in the high school at South Bend, and within a year two other valuable contributions have been published on this subject: "High School Costs", by Dr. J. F. Bobbitt, of Chicago University, in the "School Review" for October, 1915, and "Cost of Instruction in Kansas High Schools", by Professor W. S. Monroe of the State Normal School, Emporia, Kan.

The topic on which I am to report today was planned with the committee of research of the State High School Principals' Association at the time of our conference one year ago.

In November, 1915, notice was sent to the principal of every commissioned high school in Indiana that such a study was to be made and that all the school had to do if it wished to coöperate was to send for the blank forms, fill them in, and return them to my office. Thirty-four schools have returned the data indicated on this form.

PROGRAM OF TEACHER'S WORK

INDIANA UNIVERSITY
SCHOOL OF EDUCATION
BUREAU OF COÖPERATIVE RESEARCH

"COST OF INSTRUCTION"

City..............................
Teacher..............................
Number of Weeks in School Year.......
School..............................
Sex..............................
Date..............................
Annual Salary......................

No. of Period	Time of Period	MONDAY			TUESDAY			WEDNESDAY			THURSDAY			FRIDAY		
		Subject	Gr.	No. in Class	Subject	Gr.	No. in Class	Subject	Gr.	No. in Class	Subject	Gr.	No. in Class	Subject	Gr.	No. in Class
1																
2																
3																
4																
5																
6																
7																
8																
9																
10																

FIGURE I. COST OF INSTRUCTION FORM.

Time of period indicated thus: 9:00-9:45. Grade indicated thus: 9B, 9A, etc.

Subject taught: Include here also assembly, study hall duty, or any regularly assigned duty within the school day. On reverse side indicate any special duties as conducting orchestra, coaching athletics, etc., giving hours, days of week, and number of weeks of such services. Where extra periods over the regular 5 are assigned, as in science, etc., please indicate these extras by a star.

While this investigation had for its purpose the study of costs of instruction in different high school subjects under comparable conditions, the complete report will show the following subordinate topics:

1. Average salaries of teachers.
2. Average size of classes.
3. Number of large and small classes by schools, groups, and departments.
4. Average number of teaching periods a week per teacher.
5. Average number of 60-minute teaching hours a week per teacher.
6. Number pupil hours per week per teacher.
7. Number and per cent of teachers teaching each number of subjects from one to four or more.
8. Number of pupil enrollments per teacher.
9. Per cent the study hall cost is of instructional cost.
10. The per cent the credits attempted in each department are of all credits attempted.

The data from the teacher schedules for each school were assembled under the following form and from these, similar items were taken to make up the various comparative tables of this report.

Name of high school.. Date..

Number of weeks in the school year.................................. Number of minutes per class period..............................

ITEMS OF INFORMATION	Commercial.	Drawing and Art.	English.	History.	Household Arts.	Language.	Manual Arts.	Mathematics.	Music.	Physical Training.	Science.	Average.	Assembly.	Extra Class.
1. Enrollment......................														
2. Number class periods a week......														
3. Number pupil recitations a week...														
4. Number of pupil hours a week.....														
5. Cost of instruction a week.........														
6. Cost per 100 pupil hours..........														
7. The same, including assembly cost..														
8. Number credits attempted........														
9. Cost per credit..................														
10. The same, including assembly cost..														
11. Number of classes...............														
12. Average size of classes...........														
13. Number of teachers..............														
14. Average annual salary...........														
15. Average number class periods a week per teacher............														
16. Average number class hours a week per teacher.................														
17. Average number pupil hours a week per teacher.................														
18. Per cent of credits by departments.														

FIGURE II. SCHOOL TABULATION BLANK.

In passing to a more detailed description of cost factors, I wish to indicate in a preliminary way certain factors that have been taken into account in determining the time and salary to include in making up this report. In case of the salaries of superintendents or principals who teach part time, it seemed unreasonable to count the proper fractional salary against teaching account as this higher salary was paid for executive and not for teaching ability. For this report the next even $100 above that of the highest paid regular teacher in the school was taken as the salary for the superintendent or principal, and then the proportional part, as determined by his time of teaching, was charged against instruction. In estimating the teacher's weekly time, time regularly given to assembly and study hall duties has been included in the instructional account, and such study hall cost has been distributed among the departments requiring study work in proportion to the number of credits attempted in these departments to obtain the cost per credit or in proportion to the number of pupil hours of work to obtain the cost per pupil hour. It seems to the writer that study hall supervision is a legitimate charge against the instructional account of the school, but it should not be charged against the department which a given teacher represents, for a teacher may be giving time to study hall out of all proportion to the needs of his department, as in the case of a manual training teacher who teaches his subject one-half day and is in charge of study assembly one-half day. His is a non-study subject and should have no study hall charges made against it.

In a few cases extra-class time has been checked on the reports, as for regular coaching of athletics or debate, where it was evident that this was a regular feature of the teacher's work and was considered in his schedule of hours or salary.

The time of this extra-class work is included in making up the teacher's weekly time, but the cost has not been entered because in the absence of credit or definite indication of the number enrolled it was impossible to compute the cost per credit or per pupil hour. In this report two cost bases have been used:

1. The pupil hour which is absolute and means the same quantitative amount in any school at any time. By this standard we can measure the cost of the same time unit of instruction, whether the year is long or short or the daily periods long or short. The limitation of this standard is that it is not the one of common usage in evaluating school work.

2. Cost per credit, which is the evaluation given for a semester's work in a subject having one daily recitation, or it represents 1-32 of a standard four-year high school course.

Owing to the fact that the school year varies in the schools listed from 32 to 40 weeks, and as class periods vary from 40 to 70 minutes, it is apparent that a credit is not a standard thing from the time viewpoint. But it is a standard from the college entrance standpoint within the State.

Before presenting the general summaries of my findings, I wish to present on the screen and discuss with you for a few minutes the more important factors entering into instructional costs.

The two major factors in instructional costs, as I see them, are teachers' salaries and the number of pupils instructed. Contributing factors are the length of the school year, number of teaching periods per day or week, and the size of classes, and the nature of the subject (whether laboratory, requiring double periods, or recitation, requiring single periods daily). While this latter factor does not count in cost per pupil hour, it does have great influence in the cost per credit of laboratory and shop subjects.

That I may emphasize the significance of the different cost factors I have attempted to select typical cases for comparison in which all but one of the factors are uniform or nearly so.

COST FACTORS

Exhibit 1. Salary factor.

Group II, School 11

	History	Modern Language
Salary	$1,056*	$900*
Class size	19.4	19.5
Credit periods	5	5
Teaching periods	30	30
Cost per credit	$4.93	$4.45

*Chief variable.

Exhibit 2. Class size factor.

Drawing and Art

	Group II, School 2.	Group II, School 13
Salary	$810	$810
Class size	9.5*	35.*
Credit periods	10	10
Teaching periods	40	40
Cost per credit	$10.65	$2.88

Exhibit 3. Credit period factor.

Group II, School 10

	Manual Arts	Mathematics
Salary	$1,025	$1,002
Class size	16	15.5
Credit periods	10*	5*
Teaching periods	39	43.6
Cost per credit	$8.22	$4.45

Exhibit 4. Teaching period factor.

Latin

	Group II, School 5	Group I, School 1
Salary	$1,036	$1,038
Class size	17.7	17.1
Credit periods	5	5
Teaching periods	30*	25*
Cost per credit	$4.90	$6.46

Exhibit 5. Like variants.

Average of Group II

	English	Mathematics
Salary	$855	$860
Class size	21	21.6
Credit periods	5	5
Teaching periods	32.3	35.1
Cost per credit	$3.56	$3.51

Exhibit 6. Opposing variants

Average cost per credit

	Group I, School I	Group III, School 10
Salary	$1,094	$665
Class size	15.8	20.8
Credit periods	.....	.....
Teaching periods	24.9	40.6
Cost per credit	$6.89	$2.60

Exhibit 7. Do like salaries produce like costs?

School —

	Drawing	Science	History
Salary	$810	$810	$810
Class size	9.5	15.6	24.5
Credit periods	10	6.5	5
Teaching periods	35	29	36.5
Cost per credit	$10.65	$5.70	$2.66

Exhibit 1 shows in moderate degree the influence of varying salaries as a factor in cost production.

"Credit periods" refers to the number of single periods a class meets weekly to earn a credit in a half-year, while "teaching periods" refers to the number of single periods a teacher teaches weekly.

In Group II, School 11, it will readily be seen that the chief variable in the cost producing items is salary, and that the cost per credit varies approximately in proportion to the salary.

Exhibit 2 illustrates the influence of class size as a factor in cost production. In this exhibit all cost factors are identical except class size, and the costs per credit are exactly in inverse ratio to the size of classes.

Monroe, thru the use of coefficients of correlation, demonstrates that the size of classes is the major factor in instructional costs in the Kansas schools. This is due to the fact that salaries seldom vary more than 20 per cent or 25 per cent from the median, while class size frequently varies 50 per cent. This is the factor that deserves most attention in the standardizing process. An increase of $200 in salary may more than be offset by an increase of 3 or 4 in the size of each class for the average teacher. And with the standard class of nineteen, as our data show for these 34 schools, it is quite possible to increase the size by 5 or 6 and still have good working conditions.

Exhibit 3 illustrates the influence of the nature of the subject in cost production. The laboratory or shop subject with twice as many daily periods for class work essentially doubles the cost, other factors being equal. Other factors vary slightly, but in such a manner as to neutralize each other in this case.

Exhibit 4 shows the influence of the number of teaching periods daily or weekly in cost production. The size of the classes varies slightly, but accounts for but a small part of the cost variation. From this we might formulate the statement that, other factors being equal, the cost per credit varies inversely as the number of weekly teaching periods.

Exhibit 5 is intended to show the influence of approximately like factors. Like factors apparently produce like results.

Exhibit 6 offers a comparison of two systems in one of which, Group I, School 1, every factor tends to produce high costs and in the other, Group III, School 10, low costs as compared with a median standard.

In visiting an Indiana city this winter I made inquiry of the high school principal concerning his subject costs and was informed that he had no tabulated data, but that the cost of instruction in each subject was about the same, as their teachers' salaries were approximately equal.

I have selected in Exhibit 7 three subjects, drawing, science, history, from one school to show that the costs are not even approximately the same, altho the teacher's salary in each case is $810. You see that each of the other three cost factors are unlike and hence we should not expect like costs.

TABLE 1.—COST OF INSTRUCTION PER CREDIT

Group and School	Commercial	Drawing and Art	English	History	Household Arts	Latin	Manual Arts	Mathematics	Modern Languages	Music	Physical Training	Science	Average
Group I													
1	5.57	11.35	5.83	6.63	8.55	6.46	13.14	5.50	7.11	3.94	......	10.93	6.89
2	8.91	11.34	4 20	4.73	13.54	6.69	12.07	4.10	5.30	2.09	6.70	6.78	5.81
3	7.00	13.98	3.20	3.39	6.98	3.83	7.18	3.46	3.95	6.34	8.16	5.73	4.21
4	7.18	10.23	3.08	3.23	8.95	5.36	7.89	2.64	3.92	......	......	4.78	4.23
5	......	......	4.58	2.93	8.25	4.36	8.20	2.98	3.73	......	......	5.89	4.44
6	4.01	18.18	4.04	5.33	6.15	7.11	11.06	4.81	4.44	6.28	2.64	5.57	5.09
7	4.89	11.98	5.87	4 63	8.84	5.73	12.15	5.08	4.74	1.81	4.52	7.85	5.82
*M	6.28	11.67	4.20	4.68	8.55	5.73	11.06	4.10	4.44	3.94	5.11	5.89	5.09
*1Q	4.89	11.34	3.62	3.31	7.61	4.86	8.04	3.22	3.93	2.09	4.52	5.35	4.34
*3Q	7.18	13.98	5.20	5.03	8.90	6.58	12.11	4.94	5.02	6.28	6.90	7.32	5.82
Group II													
1	4.27	......	3.82	4.31	7.08	5.25	20.89	3.69	4.41	1.45	......	7.16	4.48
2	3.11	10.65	2.53	2.66	7.56	4.02	6.97	3.36	4.09	1.32	.....	5.70	3.39
3	3.29	......	3.33	2.68	3.92	3.73	10.79	3.14	3.92	......	......	5.00	3.67
4	......	13.14	3.98	3.22	6.13	4.30	4.93	4.15	3.15	2.15	......	5.67	4.18
5	5.64	12.19	4.78	4.51	7.31	4.90	5.36	4.49	6.93	2.80	6.58	7.40	5.42
6	.....	11.25	2.62	2.69	4.50	3.40	4.57	2.39	2.91	1.04	......	4.35	3.10
7	3.76	4.41	3.51	2.80	4.16	3.46	5.75	3.51	4.38	.....	3.08	6.92	3.85
8	3 26	9.72	3.25	3.33	9.21	3.53	4.76	2.91	3.52	......	......	4.75	3.72
9	4.91	......	3.46	3.09	7.15	4.42	9.42	2.90	3.10	2.82	......	5.42	4.11
10	4.97	......	3.93	3.83	9.66	4.33	8.22	4.45	5.60	2.66	......	6.28	4.85
11	5.76	13.39	5.05	4.93	6.52	4.95	13.08	3.94	4.45	3.41	......	7.24	5.58
12	3.95	12 14	4.09	3.99	10.43	4.27	15.25	3.47	4.49	4.55	5.81	4.03	4.36
13	4.22	2.88	3.61	2.78	8.14	3.88	6.58	3.52	4.00	1.70	......	4.45	3.96
14	2.84	......	2.99	3.05	9.64	3.90	11.91	3.62	3.04	2.00	......	4.38	3.62
M	4.08	11.25	3.56	3.15	7.23	4 14	7.10	3.51	3.96	2.15	5.81	5.55	4.03
1Q	3.26	9.72	3.25	2.78	6.13	3.73	5.36	3.14	3.15	1.70	4.44	4.45	3.67
3Q	4.97	12.19	3.98	3.99	8.21	4.42	11.92	3.94	4 38	2.80	6.29	6.92	4.48
Group III													
1	......	......	3.13	3.12	9.05	3.93	6.38	3.74	......	1.37	......	5.43	4.26
2	5.12	3.21	3.39	3.35	5.36	2.99	6.43	3.65	2.80	1.60	......	5.19	3.61
3	......	......	3.49	2.97	6.19	6.75	......	3.26	4.46	......	......	6.19	4.26
4	4.63	......	4.83	4.94	6.47	6.23	5.45	4.69	......	......	......	8.08	5.74
5	3.47	4.57	3.09	3.37	2.76	......	9.18	3.13	8.28	1.52	......	7.01	4.20
6	......	......	3.95	6.24	......	......	......	3.04	3.74	2.48	......	5.09	4.05
7	10.00	......	4.30	4.26	7.05	4.86	......	6.55	4.17	......	......	8.34	5.31
8	4.50	8.76	2.82	4.09	3.53	5.25	......	2.51	......	1.94	......	3.84	3.49
9	11.33	......	9.24	14.44	7.61	11.03	14.06	9.82	......	......	......	15.50	10.83
10	2.23	8.98	2.21	2.17	7.60	2.67	6.81	2.40	......	2.57	......	3.43	2.60
11	......	7.95	7.97	5.56	14.87	8.35	12.50	10.00	......	8.42	......	13.29	8.09
12	2.94	6.70	2.72	2.79	9.07	8.29	14.41	3.50	3.67	2.27	......	2.87	4.00
13	9.65	......	3.78	2.92	13.05	5.64	......	3.84	3.93	......	......	4.75	4.19
M	4.63	7.33	3.49	3.37	7.60	6.23	7.99	3.65	3.93	2.10	......	5.43	4.20
1Q	3.47	5.63	3.09	2.97	6.19	4.86	6.43	3.13	3.70	1.60	......	4.75	4.00
3Q	9.65	8.35	4.30	4 94	9.07	6.75	12.50	4.69	4.32	2.48	......	8.08	5.31

*M represents the median; 1Q, the first quartile; and 3Q, the third quartile. 1Q and 3Q represent the boundaries of the middle fifty per cent of the cases or the "zone of safety".

TABLE 2.—COST OF INSTRUCTION PER 100 PUPIL HOURS (60 MINUTES)

Group and School	Commercial	Drawing and Art	English	History	Household Arts	Latin	Manual Arts	Mathematics	Modern Languages	Music	Physical Training	Science	Average
Group I													
1	4.69	9.57	4.92	5.62	7.19	5.45	11.07	4.69	5.99	3.35	......	8.70	5.81
2	8.32	7.96	5.87	6.71	9.50	9.28	8.47	5.64	7.33	1.47	4.71	7.44	6.91
3	7.18	12.97	5.03	5.33	5.55	6.04	5.70	5.44	6.22	10.09	6.50	6.04	5.82
4	6.48	8.12	4.87	5.10	7.11	8.49	6.26	4.18	6.20	......	......	6.10	5.84
5	......	......	7.23	4.62	7.12	6.89	6.51	4.70	5.90	......	......	7.25	6.19
6	3.82	17.32	3.85	5.08	5.86	6.77	10.53	4.58	3.94	5.99	2.51	5.45	4.85
7	4.41	8.87	8.76	6.88	7.86	8.50	9.00	7.45	7.01	3.01	3.35	6.72	6.78
M	5.59	9.22	5.03	5.33	7.12	6.80	8.47	4.70	6.20	3.35	4.03	6.72	5.84
1Q	4.54	8.50	4.87	5.10	7.11	6.77	6.51	4.69	5.99	3.01	3.35	6.10	5.82
3Q	6.83	11.27	5.87	5.62	7.19	8.49	9.00	5.44	6.22	5.99	4.71	7.25	6.19
Group II													
1	5.12	......	5.64	6.34	5.24	7.74	15.55	5.64	6.50	1.34	.....	5.37	5.75
2	3.19	9.00	4.22	4.42	6.30	4.93	5.81	5.58	6.83	1.00	.....	8.36	4.77
3	3.55	......	4.88	3.93	2.91	5.52	8.00	4.61	5.76	.....	.....	6.35	4.77
4	......	10.43	6.61	5.35	4 89	7.23	4.12	6.91	5.24	2.70	.....	8.47	6.22
5	4.93	9.68	7.54	7.09	5.81	7.72	4.25	7.08	10.91	2.58	7.65	8.88	6.97
6	......	9.26	4.26	4.39	3.75	5.57	3.81	3.87	4.75	.90	.....	4.81	4.25
7	2.98	3.51	5.52	4.40	3.36	5.46	4.91	5.59	6.96	......	2.57	8.00	5.12
8	5.42	8.17	5.41	5.54	7.74	5.87	3.97	4.84	5.86	......	.....	5.28	5.53
9	7.84	......	5.47	4.88	6.07	7.00	7.45	5.36	4.90	2 23	.....	7.26	5.82
10	4.76	......	5.90	5.74	7.66	6.49	6.09	6.66	8.38	1.26	.....	8.13	6.04
11	5.42	9.40	7.07	6.90	4.57	7.00	9.16	5.50	6.21	4.82	....	8.82	7.08
12	5.14	8.99	6.06	5.90	15.69	5.99	9.74	5.13	6.64	4.58	4.30	5.56	5.92
13	6.64	2.29	5.85	4.37	6.46	6.10	5.23	5.56	6.36	1.34	.....	5.68	5.49
14	5.12	......	4.43	4.52	7.14	5.77	8.86	5.35	4.49	1.63	.....	6.04	5 03
M	5.13	9.00	5.58	5.12	5.94	6.05	5.95	5.53	6.28	1.63	4.30	6.80	5.64
1Q	4.76	8.17	4.88	4.42	4.57	5.57	4.91	5.13	5.24	1.34	3.43	5.56	5 03
3Q	5 42	9 40	6.06	5.90	6.46	7.00	8.86	5.64	6.83	2.58	5.97	8.36	6.04
Group III													
1	......	......	5.69	5.73	8 48	7.21	6.00	6.73	.....	1.29	....	7.63	6.37
2	7.52	2.66	4.76	4.49	4.47	4 03	5.32	4.98	3.57	2 66	....	7.33	4 65
3	......	......	5.16	4.41	5.09	10.00	.....	4.84	6.75	.....	.....	8.73	6.00
4	8 90	......	9.68	9.33	15.44	11.74	5.12	8.83	.....	...	...	13.42	10.23
5	6.10	4.03	5.41	5.89	2.60	......	7.94	5.48	32.21	1 72	.....	9.28	6.07
6	......	......	4.73	11.93	......	.....	......	5.77	7.09	2 32	.....	9.54	7.11
7	16.42	.....	7.17	7.05	5.88	8.12	......	10.95	5.91	......	.....	14.23	9.14
8	8.42	8.25	5.30	7.68	4.15	9.84	......	4.71	.....	3.67	.....	5.67	5.98
9	21.21	......	17.36	27.08	7.14	20.57	13.26	18.46	......	......	.....	29.69	16.96
10	4.16	8.41	4.13	4.06	7.07	5.00	6.39	4.49	.. ...	2.80	.....	6.22	4.60
11	......	7.45	14.88	10.42	13.94	15.35	11.72	18.38	....	16.00	.....	8.97	13.41
12	5.23	1.48	4.82	4.97	8.06	14.67	12.72	6.22	6 52	1.00	.....	5.10	5.13
13	18.30	......	6.07	5.47	12.41	10.61	......	7.44	7.35	....	......	7.96	7.63
M	8 42	5.74	5 41	5.89	7.10	10.00	7.16	6.22	6.75	2.49	.....	8.73	6.37
1Q	6.10	3.34	4 82	4.97	5.09	8.12	6 00	4.98	6 20	1.72	.....	7.33	5.98
3Q	16.42	7.85	7.17	9.33	8.48	11.74	11.72	8.83	7.22	2.80	.....	9.54	9.14

The following table (3) shows a comparison of medians of the schools of Groups I and II combined, with the medians of the 25 schools of Dr. Bobbitt's study.

TABLE 3.—COST OF INSTRUCTION PER 100 STUDENT HOURS

	Commercial	Drawing and Art	English	History	Household Arts	Latin	Manual Arts	Mathematics	Modern Languages	Music	Physical Training	Science	Total
Indiana (21 schools)...	5.12	9.00	5.52	5.33	6.30	6.49	6.51	5.44	6.21	2.40	4.30	6.72	5.82
Bobbitt (25 schools)...	6.90	......	5.10	6.20	6.10	7.10	9.20	5.90	6.30	2.30	......	6.00	6.20

COST OF INSTRUCTION

How much should a community pay for a half-year's instruction in each of the most commonly offered subject groups? On the basis of general principles, costs should depend upon the educational and practical values of the subject, but educational fashions, no doubt, exercise an appreciable influence. What community standards of judgment are I do not know, but Table 1 shows the prices paid by each of the 34 schools coöperating in this study for each credit attempted. Table 2 shows the cost per 100 student-hours for the same subjects and schools. One hundred hours of instruction is equivalent to 7 school months or to 143 recitation periods of 42 minutes each.

Schools designated as Group I have 500 or more pupils or are located in cities of more than 20,000 population. Those of Group II have 200 to 499 pupils or are located in cities of from 4,000 to 10,000 population; while schools of Group III have less than 200 pupils.

All the schools in Group I and all but one in Group II are members of the North Central Association of Colleges and Secondary Schools. But one school in Group III is a member of this association. The schools of Groups I and II have an average session of more than 36 weeks per year, while those of Group III average about 32 weeks a year.

The schools within any group may be considered to be approximately equal in aims and standards. No doubt inequalities exist, but it may be seriously questioned whether there is any correlation between high costs and superior quality of product. The differences in cost are probably due largely to the application or the non-application of the best administrative standards. Within practically every subject within every group some school is paying twice as much per credit or per 100 student-hours as is some other school of that same group. Nor is this wide variation confined to the newer subjects of the program, but is equally apparent in English, history, and mathematics. Reference to Table 1 reveals the following extreme variations in the cost per credit of certain subjects in the schools of Group I: commercial, $4.01 to $8.91; history, $2.93 to $6.63; household arts, $6.15 to $13.54; mathematics, $2.64 to $5.50; music, $1.81 to $6.34; and science, $4.78 to $10.33.

Not only is there great variation in costs between schools of the same group for any subject, but on examination of Table 1 (Group II medians) great variation is evident between the median costs of different subjects, ranging from $11.25 for drawing to $2.15 for music, with foreign languages and commercial subjects occupying a median place and manual arts costing about twice as much as English or mathematics. The low cost of music is accounted for by the excessively large class size. Classes of under 30 in music were given .2 credit for every class period a week where it was apparent from the description of the course that some study was required outside the class period. Larger classes and chorus groups were given .1 credit unless otherwise specified in the report of the school.

In Tables 1 and 2 the median costs are computed for each subject and for each group of schools. Table 1 should be read as follows: School 1 of Group I is paying $5.83 per credit for instruction in English, and $6.89 on the average for all subjects combined. The median school of Group II is paying $3.15 per credit for history instruction, and the zone of safety lies between $2.78 and $3.99. Blank spaces in the tables indicate that no classes in these subjects were reported by these schools.

While it is neither practicable nor desirable that every school conform to its group median, yet the suggestion offered by Dr. Bobbitt* may well be given serious consideration, namely: to keep the costs within the limits of these of the middle 50 per cent of the group, which limits he designates as the "Zone of Safety".

Table 1 shows that English, history, and mathematics have

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*"High School Costs", *School Review*, Oct., 1915.

the lowest costs (if music be excluded) while Table 5 shows that these and commercial are the only subjects that have a median class size of more than 20 pupils.

The cost per 100 student hours is more uniform from subject to subject than is the cost per credit, for the latter requires daily double periods in some of the subjects while only single periods in such subjects as English and mathematics. This difference in costs on the two bases may be illustrated by contrasting household arts and Latin in the medians of the schools of Group II. On the credit basis, household arts costs $7.23 and Latin $4.14; while on the 100 student-hour basis, household arts costs $5.94 and Latin $6.05. For equal teaching time, household arts costs less than Latin, but for a credit on the school records, it costs 75 per cent more.

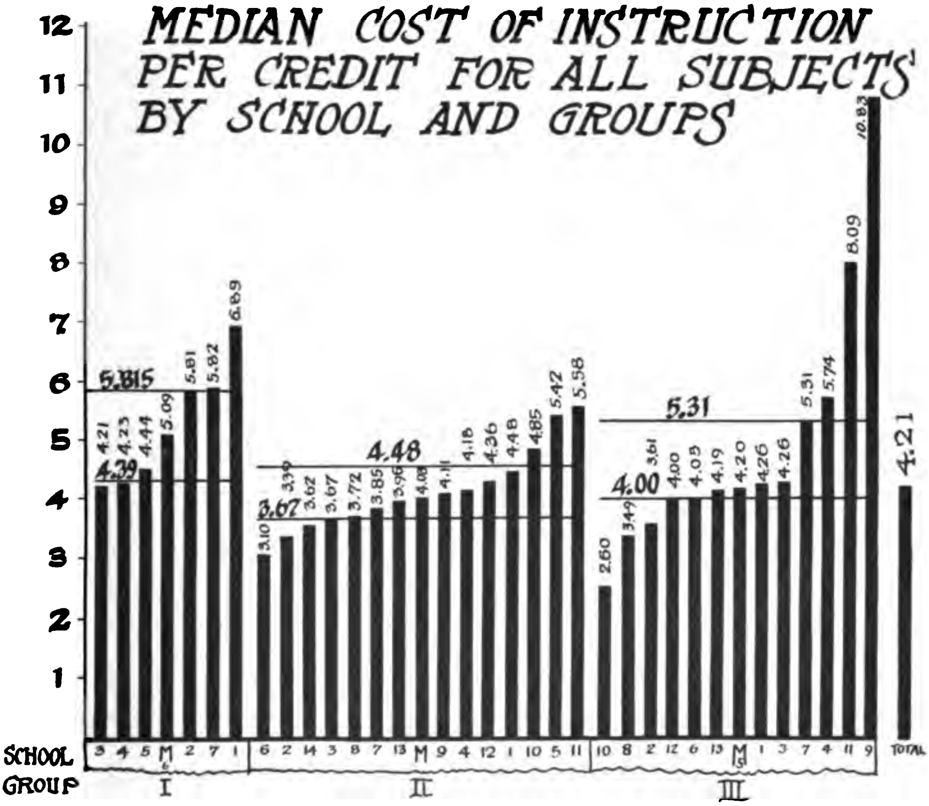

FIG. III.

Figure III represents graphically the cost per credit for all subjects combined for each school, and includes also group and total medians. "M" indicates the medians, and the horizontal lines drawn across the cost bars indicate the limits of the zones of safety.

The twelve subject groups, used thruout this report at the top of each table involving subjects, are as follows: Commercial, drawing and art, English, history, household arts, Latin, manual arts (including mechanical drawing, shop work, printing, etc.), mathematics, modern languages, music, physical training, and science (including agriculture).

TABLE 4.—AVERAGE SALARIES OF TEACHERS

Group and School	Commercial	Drawing and Art	English	History	Household Arts	Latin	Manual Arts	Mathematics	Modern Languages	Music	Physical Training	Science	Average
Group I													
1	1,009	1,050	1,189	1,048	855	1,038	1,211	1,020	1,100	1,100	......	1,300	1,094
2	1,062	900	917	900	910	874	928	852	916	1,000	900	1,113	948
3	786	990	846	867	846	888	814	821	884	990	810	1,012	885
4	900	900	865	855	853	885	900	870	890	......	......	868	892
5	......	......	925	900	832	833	878	829	930	......	......	861	878
6	886	1,200	960	1,088	1,033	979	985	1,005	926	1,500	1,070	1,204	1,008
7	962	968	1,036	1,030	900	1,080	1,269	1,057	1,101	1,350	1,278	1,151	1,065
M	931	979	925	900	855	888	928	870	926	1,100	985	1,113	948
Group II													
1	805	......	833	756	850	780	1,087	810	821	850	......	936	839
2	810	810	826	810	810	900	1,100	898	810	810	......	810	857
3	890	......	815	919	675	810	907	810	810	......	......	960	840
4	......	920	826	1,100	756	920	810	981	756	850	......	1,000	905
5	1,036	1,036	985	1,161	1,036	1,036	1,200	1,111	936	1,061	806	1,112	1,046
6	......	720	855	752	720	765	720	830	756	720	......	882	800
7	810	900	860	810	818	859	1,200	904	810	......	720	874	880
8	680	680	709	900	695	765	680	680	680	......	......	680	707
9	765	......	796	765	727	765	810	801	810	810	......	785	785
10	1,082	......	791	930	850	943	1,025	1,002	800	810	......	1,025	921
11	1,024	1,500	950	1,056	950	950	1,300	1,011	900	900	......	1,000	1,003
12	1,168	765	943	1,155	945	945	1,000	1,046	945	765	650	1,008	1,000
13	810	810	814	765	765	800	810	833	810	720	......	810	808
14	828	......	787	773	540	765	810	810	765	1,012	......	841	782
M	819	810	826	855	787	835	953	860	810	810	720	909	849
Group III													
1	......	......	701	713	800	722	800	744	......	960	......	904	790
2	900	675	810	841	765	720	855	810	720	675	......	855	798
3	920	......	810	800	640	1,000	......	920	640	......	......	802	813
4	680	......	680	834	900	900	800	800	......	......	......	748	795
5	680	510	850	1,000	213	......	680	850	850	510	......	911	734
6	......	......	700	668	......	......	......	600	800	700	......	732	700
7	800	......	734	749	626	700	......	763	700	......	......	800	730
8	504	560	566	720	672	672	......	504	......	560	......	644	609
9	800	......	640	723	640	900	900	800	......	......	......	800	756
10	700	680	680	800	680	709	600	610	......	680	......	720	665
11	......	714	684	800	714	584	800	800	......	640	......	615	707
12	670	670	716	670	580	595	692	1,050	716	508	......	815	712
13	920	......	810	800	640	1,000	......	920	640	......	......	802	813
M	700	672	701	749	676	720	800	800	720	658	......	800	734

TEACHERS' SALARIES

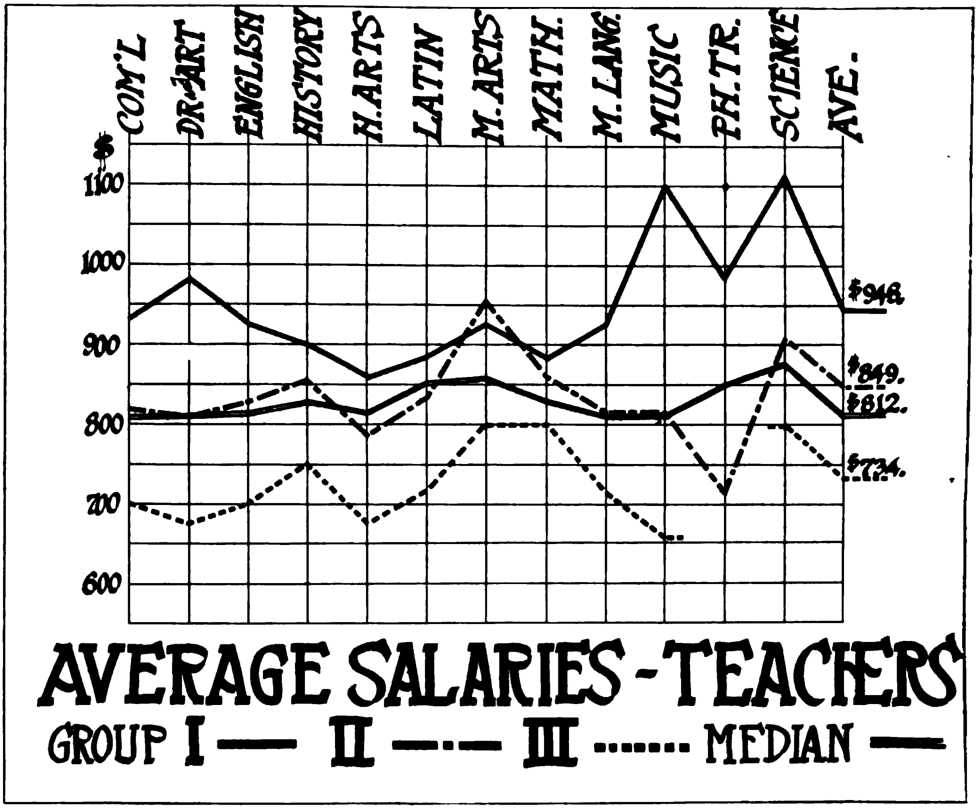

FIG. IV.

Table 4 and Figure IV show the average annual salaries paid in each department of work for each school. The median results are indicated for each group. The table should be read as follows: School 5 of Group II is paying an average salary of $1,161 for its history teachers, $1,200 in manual arts, $1,112 in science. Also the schools of Group I are paying a median salary of $948; Group II, $849; and Group III, $734.

Salaries seem to vary with the size of the school if we may judge by group medians. However, an analysis of the original data for the schools of Group III shows that monthly salaries are as high as in Group II, the annual differences being due to the difference in the length of the term in the two groups. The medians of Group II show that manual training and science teachers receive the highest salaries, $953 and $909, respectively. No doubt the higher salaries in these departments are due to the fact that these positions are generally occupied by men. Omitting physical training, which has but three representatives in Group II, household arts teachers are paid the lowest salaries ($787), while teachers of Latin, history, and mathematics are paid about the median salaries for this group. In Group I, science and music pay the highest salaries; household arts, mathematics, and Latin, the lowest salaries; and the remaining seven subjects pay about median salaries. In Group III the highest salaries are in science, manual training, and mathematics; the lowest in music, drawing, and household arts; while the remaining subjects of this group pay about median salaries.

More noticeable than salary differences in Group II are salary uniformities by departments. These figures give but little guidance to the prospective teacher who is desirous of entering the field offering the greatest financial rewards. The higher salaries are paid in the schools of Group I. Teachers should prepare to teach in schools of this group not only because of higher salary, but also because of fewer teaching periods a week and because teachers in this group tend to specialize in one subject instead of teaching two to five subjects as Table 12 shows to be the condition in schools of Group III.

These figures differ slightly from those of Bobbitt,* who found that teachers of shop work and music received the highest salaries; science teachers about the median salary; and modern languages and household arts, the lowest. The schools reported in his study correspond to those of Groups I and II of this investigation. Monroe† found agriculture, manual training, and science paying the highest salaries, and English and household arts, the lowest.

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*"High School Costs". *School Review*, Oct., 1915.

†"Cost of Instruction in Kansas High Schools". Published by the State Normal School, Emporia, Kan.

SIZE OF CLASSES

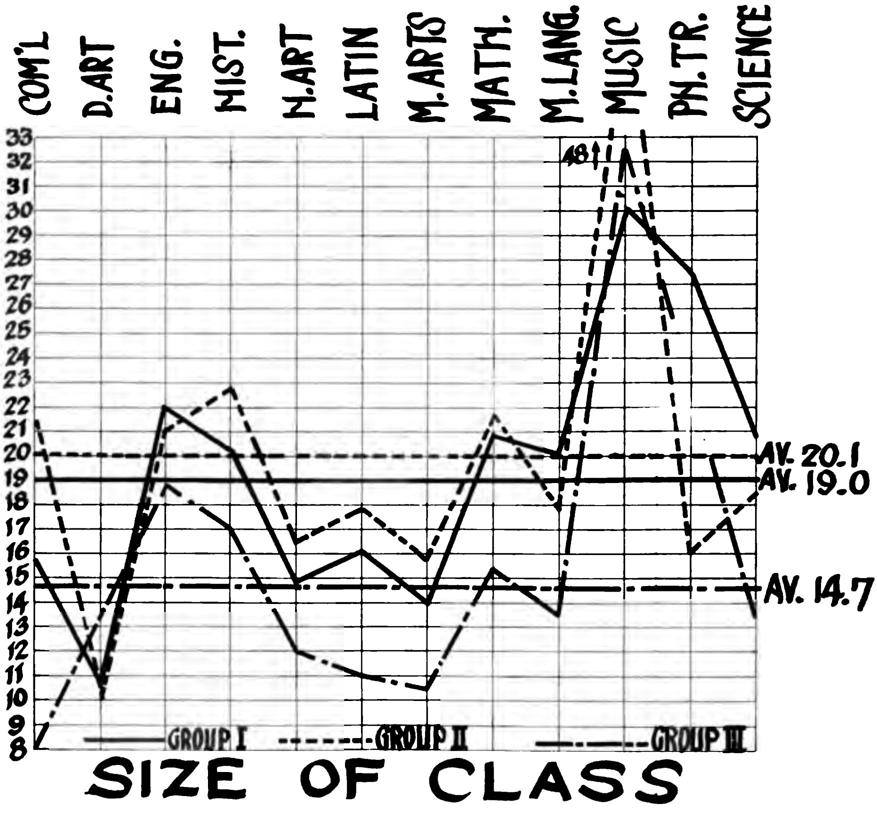


FIG. V.

TABLE 5.—AVERAGE SIZE OF CLASSES

Group and School	Commercial	Drawing and Art	English	History	Household Arts	Latin	Manual Arts	Mathematics	Modern Languages	Music	Physical Training	Science	Average*
Group I													
1	18.1	9.2	21.5	16.9	11.3	17.1	9.2	18.8	16.4	28.0	......	12.6	15.8
2	13.5	11.3	23.7	18.5	9.6	12.2	11.5	20.9	17.9	68.3	19.2	21.8	17.7
3	12.5	9.1	22.1	20.4	22.0	18.8	15.8	19.9	19.9	9.8	14.2	20.2	19.0
4	11.0	14.6	22.3	21.7	14.8	14.9	19.0	25.5	19.9	......	......	20.6	19.8
5	......	......	20.2	26.7	10.5	16.1	13.9	24.0	22.6	......	......	22.0	19.7
6	22.1	6.8	23.8	20.4	16.8	13.8	10.2	20.9	22.4	30.3	35.6	20.4	18.2
7	31.1	13.4	21.0	21.1	15.0	18.0	15.4	20.6	21.1	62.0	39.8	21.3	20.5
M	15.8	10.2	22.1	20.4	14.8	16.1	13.9	20.9	19.9	30.3	27.4	20.6	19.0
Group II													
1	21.1	......	22.8	17.0	20.0	15.0	8.0	22.3	18.4	97.5	......	21.1	20.4
2	19.3	9.5	24.6	24.5	13.7	23.8	14.6	23.7	15.2	146.7	......	15.6	20.1
3	28.7	......	21.5	28.5	21.5	17.3	11.2	20.9	15.5	......	......	18.0	20.8
4	......	10.0	19.7	34.0	18.3	18.0	22.5	20.3	22.0	37.5	......	17.6	21.9
5	23.3	12.0	18.6	21.8	19.7	17.7	28.0	20.5	10.8	66.0	13.3	19.0	19.1
6	......	8.0	26.2	21.5	20.0	20.0	17.5	31.6	22.8	87.0	......	21.5	23.3
7	24.5	27.0	21.3	23.5	24.8	20.1	22.7	22.8	17.0	......	29.2	15.4	21.3
8	18.0	10.0	21.6	27.0	10.3	18.4	18.0	22.5	16.4	......	......	21.8	20.1
9	14.3	......	20.8	22.2	14.7	14.4	14.3	20.4	23.4	48.0	......	17.4	19.0
10	12.6	......	17.1	18.8	11.0	16.4	16.0	15.5	11.8	38.0	......	15.0	15.1
11	21.2	14.5	17.5	19.4	21.5	18.2	15.4	24.9	19.5	22.0	......	12.9	18.6
12	25.6	9.0	20.0	24.0	13.0	22.5	11.0	22.4	20.0	28.5	16.0	22.3	21.1
13	15.5	35.0	20.3	25.4	13.3	16.7	16.5	20.2	16.2	47.3	......	20.3	19.2
14	24.7	......	25.8	21.8	7.0	15.9	8.5	18.3	18.5	65.5	......	20.2	20.0
M	21.2	10.0	21.0	22.8	16.5	17.8	15.7	21.6	17.7	48.0	16.0	18.5	20.1
Group III													
1	......	......	20.1	19.5	13.0	15.0	15.7	15.3	......	87.5	......	14.6	16.4
2	13.0	25.0	19.6	21.3	17.8	20.5	17.5	17.8	22.5	25.0	......	13.6	19.5
3	......	......	24.7	23.7	19.0	11.0	......	22.0	18.2	......	......	18.8	20.0
4	13.0	......	12.2	13.6	5.5	11.0	17.0	14.0	......	......	......	8.0	11.6
5	16.0	16.0	21.3	22.0	12.0	......	10.0	21.0	3.0	48.0	......	10.5	15.5
6	......	......	13.0	7.3	......	......	......	12.3	13.3	40.0	......	9.0	11.0
7	5.0	......	10.7	11.0	12.0	9.0	......	7.7	10.5	......	......	6.0	9.2
8	8.0	8.0	13.6	11.0	20.0	8.0	......	14.3	......	18.0	......	14.0	12.1
9	6.0	......	7.3	4.3	12.0	7.0	8.0	7.3	......	......	......	4.0	6.7
10	25.0	9.0	25.2	30.0	10.7	20.2	11.0	22.8	......	54.0	......	16.8	20.8
11	......	15.0	5.8	9.0	8.0	5.0	8.0	5.0	......	19.0	......	7.0	6.9
12	16.0	12.5	18.8	17.0	8.0	4.6	6.0	20.6	13.3	16.0	......	20.0	14.7
13	7.0	......	19.1	26.6	7.0	14.6	......	19.6	14.5	......	......	17.0	17.4
M	8.0	13.7	18.8	17.0	12.0	11.0	10.5	15.3	13.3	32.5	......	13.6	14.7

*Music and Physical Training omitted in computing average.

TABLE 6.—Number and Per Cent of Large and Small Classes

Group and school	Total number classes	Number classes 10 or less	Number classes more than 30	Per cent classes 10 or less	Per cent classes more than 30
Group I					
1..........	123	27	4	22.0	3.2
2..........	139	26	3	19.0	2.0
3..........	120	10	0	8.3	0.0
4..........	109	10	1	9.2	.9
5..........	106	13	7	12.3	6.6
6..........	190	45	19	23.7	10.0
7..........	243	23	33	9.5	13.6
Average........	147	22	9.6	14.5	6.5
Group II					
1..........	85	8	3	9.4	3.5
2..........	68	7	8	10.3	11.8
3..........	89	5	4	5.6	4.5
4..........	35	2	2	5.7	5.7
5..........	57	8	4	14.0	7.0
6..........	39	0	9	0.0	23.1
7..........	97	4	9	4.1	9.3
8..........	41	3	2	7.3	4.9
9..........	50	2	2	4.0	4.0
10..........	52	10	1	19.2	1.9
11..........	74	9	3	12.2	4.1
12..........	53	4	0	7.5	0.0
13..........	57	3	4	5.3	7.0
14..........	54	8	6	14.8	11.1
Average........	60	5.1	4	8.5	6.7
Group III					
1..........	48	9	3	18.7	6.2
2..........	28	1	2	3.5	7.0
3..........	31	5	3	16.1	9.7
4..........	18	8	0	44.4	0.0
5..........	22	4	4	18.2	18.2
6..........	17	7	0	41.2	0.0
7..........	16	12	0	75.0	0.0
8..........	21	7	0	33.3	0.0
9..........	15	13	0	86.7	0.0
10..........	36	3	4	8.3	11.1
11..........	13	12	0	92.3	0.0
12..........	25	6	0	24.0	0.0
13..........	30	5	0	16.7	0.0
Average........	24.4	7.1	1.2	28.8	5.3

TABLE 7.—NUMBER AND PER CENT OF VERY SMALL AND VERY LARGE CLASSES BY GROUPS AND SUBJECTS

Class Items	Commercial	Drawing and Art	English	History	Household Arts	Latin	Manual Arts	Mathematics	Modern Languages	Music	Physical Training	Science	Average
Group I													
Total number classes	97	43	178	106	63	79	81	141	90	23	46	93	1,040
Number classes 10 or less	18	30	8	5	19	15	32	6	7	3	2	9	154
Number classes more than 30	15	0	6	2	1	0	0	2	2	12	24	3	67
Per cent classes 10 or less	14.8	70.0	4.5	4.7	30.2	19.0	39.5	4.3	7.8	13.0	4.3	9.7	14.5
Per cent classes more than 30	14.2	0.0	3.4	1.9	1.6	0.0	0.0	1.4	2.2	52.2	52.2	3.2	6.5
Group II													
Total number classes	73	13	180	84	45	87	37	135	75	24	17	83	853
Number classes 10 or less	7	5	2	1	7	11	12	7	8	3	1	9	73
Number classes more than 30	9	1	13	8	2	0	0	4	2	13	4	1	57
Per cent classes 10 or less	9.6	38.5	1.1	1.2	15.5	12.6	32.5	5.2	10.7	12.5	5.9	10.8	8.5
Per cent classes more than 30	12.3	7.7	7.2	9.5	4.4	0.0	0.0	3.0	2.7	54.1	23.5	1.2	6.7
Group III													
Total number classes	8	10	67	36	21	36	11	50	19	16	......	45	319
Number classes 10 pr less	4	2	13	10	6	20	4	12	5	0	......	16	92
Number classes more than 30	0	3	1	2	0	1	0	1	0	8	......	1	17
Per cent classes 10 or less	50.0	20.0	19.4	27.8	28.6	55.6	36.4	24.0	26.3	0.0	......	35.6	28.8
Per cent classes more than 30	0.0	30.0	1.5	5.5	0.0	2.8	0.0	2.0	0.0	50.0	......	2.2	5.3

Table 5 and Figure V show the facts relative to size of classes which is, perhaps, the most important factor in cost production.

Music and physical training have been omitted from the school averages in computing the right-hand column of the table, the latter, because of its rare occurrence and its wide variability, and the former, because of its excessive variation (13 to 147). When music classes are included, the average class size of a school is often raised by 5 or 10, due to the fact that some of these chorus groups often total 150 to 200 pupils. The average size of music classes is about two and one-half times that of other classes considered collectively.

Every group exhibits wide variations in size of classes in different departments. The only subjects that seem to have attained a standard favoring a moderate cost are English, history, and mathematics. These are the only subjects, aside from music, that have an average size of 20 pupils or more in all groups combined. Drawing, household arts, and manual arts classes are far below average size in all groups. These subjects have highly desirable values, but it may be honestly doubted whether they are worth from two to four times the other subjects of the curriculum as appears in Table 1.

The average class size is small in Group III because of the small total enrollment in these schools, one of the number having as few as 20 pupils. But few teachers enter the service of schools in Groups I and II without at least two years of teaching experience. Graduation from a standard college and some professional training are also the rule. In the light of these facts, it does not seem unreasonable to the writer to standardize the average class in these schools at 24 or 25 pupils instead of at 19 or 20. The difference in costs would be a very material one.

Why have standard class groups of 10 or 15 as in the case of the subjects of drawing, household arts, and manual arts? The elective system, no doubt, accounts for it in part, but other elective subjects are standardized at a much higher level. The argument for small classes for the purpose of individual instruction applies no more to drawing than to English.

A better administration of the elective system will tend to greatly reduce costs. To illustrate variable administrative practice in the same school, an example from one of the largest schools reporting is here given. In this school 8 Latin courses are offered, but in the 12B grade only 6 pupils are enrolled for Latin, and in the 12A grade but four. One teacher is giving more than one-third her time to 10 pupils at a cost of about $13 a credit. In the German department of the same school the 12A and 12B grades are combined for fourth year German, and the 12 pupils here enrolled receive instruction at a cost of $6 per credit. Economical administrative practice would indicate that in many subjects having small classes there should be an organization on the year rather than on the half-year basis, and in the smaller schools there should be an alternation of courses in the eleventh and twelfth grades. One school reporting has 6 half-year courses in household arts with not more than 8 pupils in any class. In such a situation it would seem quite possible to effect a reorganization providing for 3 classes with 15 or 16 pupils per class. The cost of one full-time teacher would be thus saved. In certain cases where very small classes are unavoidable, arrangements might be made to have each class recite for a period of 20 or 25 minutes instead of 45. Two such short-period classes could be considered as the equivalent of one regular class in the assignment of the teacher's time. One school of Group I has 20 classes in drawing and art and every class has an enrollment of 10 or less. Here again one-half the cost could be saved by doubling the class size, which would seem to be entirely possible in a school of this size without in any way reducing the number of courses offered.

Table 6 shows the number and per cent of classes having 10 or less pupils or more than 30, by schools and groups. The table should be read as follows: School 1 of Group I has 123 classes of which 27, or 22 per cent, have 10 pupils or less, and 4 classes, or 3.2 per cent, have more than 30 pupils.

The high per cent of very small classes in Group III (28.8) is due to the small enrollment in these schools; while the fairly high per cent (14.5) in Group I is due in part to the great variety of electives offered, but is also the result of poor administrative practice referred to above. The variations in administrative practice are great within any group. For example, school 6 of Group I has 23.7 per cent of very small classes, while school 3 has but 8.3 per cent. In Group II school 10 has 19.2 per cent of very small classes, while school 6 has none. In Group III school 11 has 92.3 per cent of small classes, and school 2 has 3.5 per cent. With respect to classes of more than 30 pupils, Group I has a range from 0 per cent to 13.6 per cent; Group II, 0 per cent to 23.1 per cent; and Group III, 0 per cent to 18.2 per cent.

Table 7 indicates the number and per cent of very small and very large classes by groups and subjects. The table should be read as follows: In Group II there are 73 classes reported in commercial subjects of which 7, or 9.6 per cent, have 10 or less pupils, and 9, or 12.3 per cent, have more than 30 pupils. In Group II, 7 of the 12 subjects (drawing, household arts, Latin, manual arts, modern language, music, and science) have more than 10 per cent of their classes with 10 or less pupils. In two of these subjects (drawing and manual arts) more than 20 per cent of the classes have 10 or less pupils. Seventy per cent of drawing classes in Group I have 10 or less pupils. Commercial subjects, music, and physical training show a high per cent of oversize classes, but as physical training is reported from but 3 of the schools of this group, it can hardly be said that this subject contributes much in the way of oversize classes to the total situation.

Table 8 indicates a fairly close agreement as to standard size of classes whether the schools be in Indiana, Kansas, or in schools of several of the central States.

Table 8 shows a comparison of medians of Groups I and II of this study with medians as determined by Bobbitt for 25 cities, and medians found by Monroe for 54 Kansas cities of the first and second class.

TABLE 8.—SIZE OF CLASSES

	Commercial	Drawing and Art	English	History	Household Arts	Latin	Manual Arts	Mathematics	Modern Languages	Mucis	Physical Training	Science	Average
Indiana (21) (Childs).....	20.3	10.0	21.5	21.8	14.8	17.3	15.4	20.9	18.5	47.7	19.2	20.2	19.7
Central States (25) (Bobbitt)	19.0	18.0	22.0	21.0	17.0	17.0	14.0	21.0	17.0	58.0	32.0	20.0	19.0
Kansas (54) (Monroe)...	19.0	......	21.8	21.5	15.5	15.3	13.5	21.8	15.7	......	......	19.7	19.0

TABLE 9.—NUMBER OF CLASS PERIODS A WEEK PER TEACHER

Group and School	Commercial	Drawing and Art	English	History	Household Arts	Latin	Mathematics	Manual Arts	Modern Languages	Music	Physical Training	Science	Average
Group I													
1	22.5	25.0	25.0	25.0	22.5	25.0	25.0	25.9	25.0	25.0	......	25.0	24.9
2	35.0	35.0	31.7	33.9	35.0	32.2	33.5	34.6	31.0	35.0	35.0	31.7	34.2
3	36.5	40.0	37.5	40.7	33.5	38.6	40.0	38.3	35.0	40.0	35.0	38.0	38.2
4	37.5	30.0	36.6	35.0	32.3	30.0	40.0	38.0	31.4	......	......	30.7	34.9
5	......	......	28.7	37.3	37.0	35.0	37.5	37.3	33.6	......	......	28.3	33.5
6	25.	25.	25.	25.	25.	25.	24.	25.	25.	28.	28.4	26.4	25.1
7	33.1	28.0	23.5	28.0	28.2	28.2	31.7	29.3	30.7	30.0	35.5	29.9	28.4
M	34.0	29.0	28.7	33.9	32.3	30.0	33.5	34.6	31.0	29.0	35.0	29.9	33.5
Group II													
1	30.6	......	28.4	30.8	30.0	28.6	30.0	30.3	30.1	24.0	......	30.8	29.8
2	35.0	40.0	37.0	38.5	40.0	38.5	40.0	33.2	38.5	40.0	......	29.0	35.9
3	39.0	......	32.3	35.0	40.0	34.4	36.7	35.3	35.0	......	......	36.3	35.5
4	......	35.0	32.1	35.0	35.5	35.2	36.0	35.0	35.0	35.0	......	32.0	34.0
5	30.0	35.0	32.4	30.0	36.	30.	40.	36.	35.	35.	29.	29.4	33.2
6	......	40.	41.8	43.2	40.	35.	45.	38.4	37.	40.	......	45.6	41.5
7	44.	40.	31.8	36.	40.	35.	45.	31.9	30.	......	40.	30.4	34.6
8	35.	35.	30.5	30.	36.5	35.	40.	32.	35.	......	......	32.6	32.4
9	30.	......	33.5	35.	30.4	35.	30.	35.5	30.	30.	......	33.8	33.3
10	46.	......	36.2	40.	37.	40.	39.	43.6	35.	40.	......	39.	39.5
11	33.4	35.	30.5	30.	30.	30.	30.	30.6	30.	30.	......	35.	31.0
12	36.	35.	33.8	35.	35.	30.	35.	40.	30.	35.	35.	36.5	34.8
13	37.5	40.	34.8	37.	35.	38.	40.	37.1	38.	40.	......	30.	36.3
14	33.1	......	30.	34.	40.	35.	40.	35.	40.	35.	......	30.7	34.3
M	35.	35.	32.3	35.	36.2	35.	39.5	35.1	35.	35.	35.	32.3	34.4
Group III													
1	......	......	40.	40.7	34.	39.6	40.	43.	......	40.	......	44.	40.6
2	40.	42.	40.	39.	40.	40.	38.	40.	40.	42.	......	38.	39.6
3	......	......	30.	35.	31.	31.	......	38.	29.8	......	......	29.	31.5
4	40.	......	40.	42.7	42.	42.	43.	43.	......	......	......	42.	41.7
5	37.	35.	40.	41.	30.	......	37.	40.	40.	35.	......	40.1	40.0
6	......	......	34.9	36.5	......	......	......	40.	40.	35.	......	40.	38.
7	40.	......	40.	40.	37.	40.	......	38.	40.	......	......	40.	39.3
8	35.	40.	37.	40.	38.	40.	......	35.	......	40.	......	40.	38.
9	40.	......	35.	36.5	35.	40.	40.	40.	......	......	......	40.	37.7
10	38.4	42.	42.	42.2	42.	42.4	40.	37.3	......	42.	......	40.	40.6
11	......	30.	37.3	40.	30.	35.	40.	40.	......	10.	......	35.7	34.7
12	40.	40.	40.	40.	40.	40.	40.	40.	40.	40.	......	40.	40.
13	37.	......	35.2	35.	35.	35.	......	37.	35.	......	......	35.6	35.5
M	4 0.	40.	40.	40.	36.	40.	40.	40.	40.	40.	......	40.	39.3

NUMBER OF CLASS PERIODS

Table 9 and Figure VI show the number of class periods a week per teacher by subjects, schools, and groups. The average number of class periods a week is greater in the small schools than in the large schools.

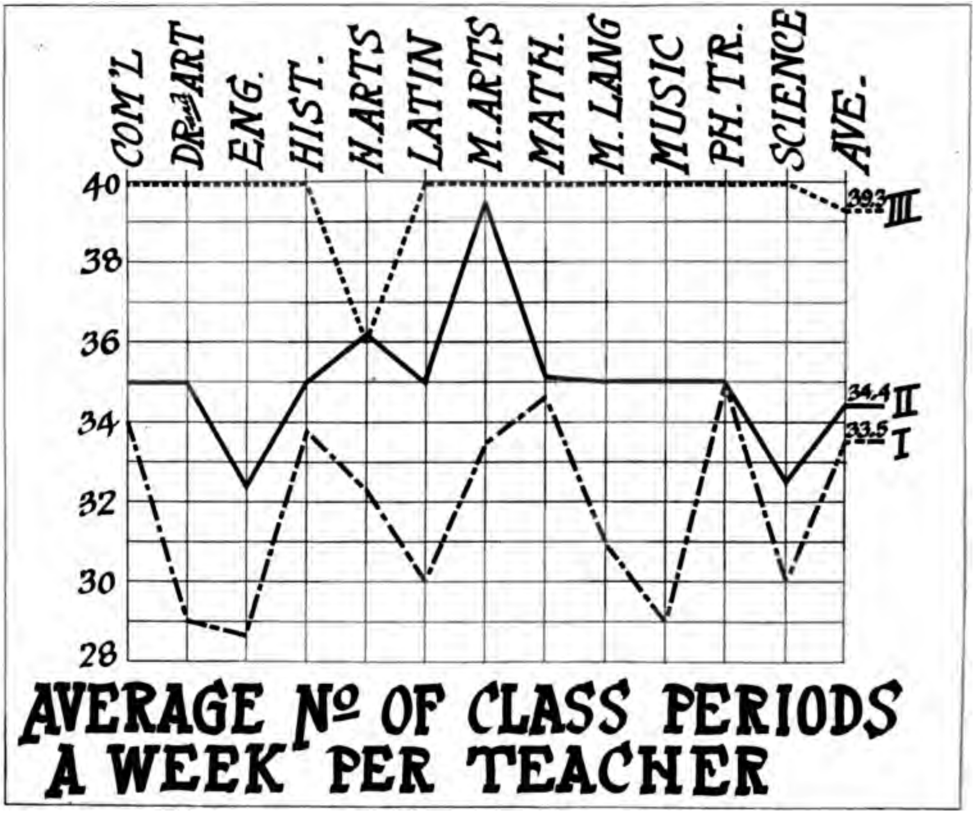


FIG. VI.

Schools 1 and 6 of Group I show a small number of class periods a week per teacher, and reference to Table 6 shows these schools to have the largest number of class hours a week per teacher. This is accounted for by the fact that these schools have combined recitation and supervised study periods of 75 and 70 minutes, respectively. The teachers in these schools are practically free from special conference hours which are generally required in high schools as extra time.

Reference to Table 14 in connection with Table 9 indicates that thirty periods a week is the standard teaching time in the schools of Groups I and II. The excess shown in Table 9 represents assembly and extra-class assignments. In Group III the weekly teaching time is about 35 periods, with 5 periods for assembly duty.

The tendency in schools of Groups I and II to require less class work of the English teachers than the average for other departments is commendable in view of the theme work of the English teachers. Just why the subject of drawing in Group I, which has a moderate salary cost and an average class size of 10, should also be one requiring a small number of class periods a week, I am unable to say. Such subjects as drawing and music require the least outside preparation and work on the part of the teacher and should be given a maximum of classroom periods weekly rather than a minimum.

A standard of 30 teaching periods a week and 5 assembly periods would seem to be the highest maximum desirable for schools of Groups I and II. As a matter of fact, the North Central Association at its recent meeting fixed this as a maximum standard because this was the generally accepted standard in practice and it was thought that a few accredited schools were requiring too many periods of extra-class work from their teachers to maintain the highest standards of efficiency in preparation. For economic reasons the standard for schools of Group III will probably best remain at 40.

TABLE 10.—NUMBER OF CLASS HOURS A WEEK PER TEACHER

Group and School	Commercial	Drawing and Art	English	History	Household Arts	Latin	Manual Arts	Mathematics	Modern Languages	Music	Physical Training	Science	Average
Group I													
1	30.6	31.2	31.2	31.2	27.8	31.2	31.2	32.4	31.2	31.2	......	31.2	31.1
2	26.3	26.3	23.8	25.5	26.2	24.2	25.1	26.0	23.2	26.3	26.3	23.8	25.6
3	25.6	28.0	27.7	28.5	23.5	27.0	28.0	26.8	24.5	28.0	24.5	26.6	26.7
4	26.2	21.0	25.4	24.5	22.6	21.0	28.0	26.6	22.1	......	......	21.5	24.4
5	......	......	20.1	26.1	25.9	24.5	26.3	26.1	23.5	......	......	19.8	23.5
6	29.2	29.2	29.2	29.2	29.2	29.2	28.0	29.2	29.2	35.1	36.2	30.8	29.3
7	24.8	21.0	17.6	21.0	21.2	21.2	23.8	22.0	23.0	22.5	26.6	22.5	21.3
M	26.3	27.1	25.4	26.1	25.9	24.5	28.0	26.6	23.5	28.0	26.5	23.8	25.6
Group II													
1	23.0	......	21.3	23.1	22.5	21.4	22.5	22.7	22.6	18.0	......	23.1	22.4
2	23.3	26.7	24.7	25.7	26.7	25.7	26.7	22.1	25.7	26.7	......	19.3	23.9
3	29.2	......	24.2	26.2	30.0	25.8	27.5	26.5	26.2	......	......	27.2	26.6
4	......	23.3	21.4	23.3	23.7	23.5	24.0	23.3	23.3	......	......	21.3	23.3
5	21.0	24.5	22.7	21.0	25.2	21.0	28.0	25.2	24.5	24.5	20.3	20.6	23.2
6	......	26.7	27.9	28.8	26.7	23.3	30.0	25.6	24.7	26.7	......	30.4	27.7
7	30.8	28.0	22.3	25.5	28.0	23.8	30.0	22.3	21.0	......	26.7	21.3	24.8
8	24.5	24.5	21.4	21.0	25.6	24.5	28.0	22.4	24.5	......	......	22.8	22.7
9	21.0	......	22.8	24.5	21.3	24.5	21.0	24.9	21.0	21.0	......	23.0	23.3
10	34.5	......	27.2	30.0	27.8	30.0	29.2	32.7	26.2	30.0	......	29.2	29.6
11	25.0	26.2	22.9	22.5	22.5	22.5	22.5	23.0	22.5	22.5	......	26.2	23.2
12	27.0	26.2	25.3	26.2	26.2	22.5	26.2	30.0	22.5	26.2	26.2	27.4	26.1
13	26.3	28.0	24.4	25.9	24.5	26.6	28.0	26.0	26.6	28.0	......	21.0	25.4
14	24.8	......	22.5	25.5	30.0	26.2	30.0	26.2	30.0	26.2	......	23.0	25.7
M	24.9	26.2	23.5	25.5	25.9	24.1	27.8	25.1	24.5	26.2	26.2	23.0	23.4
Group III													
1	......	......	26.7	27.1	22.7	26.4	26.7	28.7	......	26.7	......	29.3	27.1
2	26.7	28.0	26.7	26.0	26.7	26.7	25.3	26.7	26.7	28.0	......	25.3	26.4
3	......	......	22.5	26.2	23.2	23.2	......	28.5	22.4	......	......	21.8	23.6
4	26.7	......	26.7	28.5	28.0	28.0	28.7	28.7	28.7	......	......	28.0	27.8
5	24.0	23.3	26.7	27.3	20.0	......	24.7	26.7	26.7	23.3	......	26.8	25.2
6	......	......	23.3	24.3	......	......	......	26.7	26.7	23.3	......	26.7	25.3
7	26.7	......	26.7	26.7	24.7	26.7	......	25.3	26.7	......	......	26.7	26.2
8	23.3	26.7	24.6	26.7	25.3	26.7	......	23.3	......	26.7	......	26.7	25.3
9	26.7	......	23.3	24.3	23.3	26.7	26.7	26.7	......	......	......	26.7	25.1
10	25.6	28.0	28.0	28.2	28.0	28.3	26.7	24.9	......	28.0	......	26.7	27.1
11	......	20.0	24.9	28.0	20.0	23.3	28.0	28.0	......	6.7	......	23.8	23.1
12	26.7	26.7	26.7	26.7	26.7	26.7	26.7	26.7	26.7	26.7	......	26.7	26.7
13	24.7	......	23.5	23.3	23.3	23.3	......	24.7	23.3	......	......	23.7	23.7
M	26.7	26.7	26.7	26.7	24.0	26.7	26.7	26.7	26.7	26.7	......	26.7	26.7

NUMBER OF CLASS HOURS

Table 10 indicates the number of 60-minute hours spent weekly by teachers in class and assembly duties in these schools by departments and groups. The teachers of Group III schools work more periods and also more hours than in either Groups I or II. Teachers of Group I average .9 period less per week than in Group II, but their actual time in hours is 2.2 more, due to the somewhat longer class period in these schools. (In this report, the intermission between classes has been included in the recitation time because the majority of schools did not indicate the time in such a manner that the length of the intermission could be determined.) Twenty-five hours a week of regularly assigned school duties requiring instruction or supervised study groups seems to be the standard for these schools, and the average length of class period is 42 minutes. The median for the schools of Groups I and II is 24.8 hours a week. Bobbitt found a median of 23.2 hours, but his investigation is based on teaching time only, while this report includes study hall duty with recitation time.

NUMBER OF STUDENT HOURS

The teacher's total load is determined by two factors: first, the number of classes daily (the most important factor), and second, the number of pupils in all classes. By combining these two factors and stating the result in hours instead of class periods, we may say the teacher's load is determined by the number of student-hours a week which her work represents.

TABLE 11.—NUMBER OF STUDENT HOURS A WEEK PER TEACHER

Group and School	Commercial	Drawing and Art	English	History	Household Arts	Latin	Manual Arts	Mathematics	Modern Languages	Music	Physical Training	Science	Average
Group I													
1.........	539	264	673	522	313	535	288	618	513	864	......	393	514
2.........	366	296	555	470	252	296	289	541	415	1,791	502	475	434
3.........	320	212	612	582	432	509	443	536	489	260	346	579	508
4.........	390	308	567	531	335	313	538	680	444	......	......	440	470
5.........	......	......	414	700	323	395	375	627	531	......	......	385	456
6.........	645	192	692	595	490	402	260	609	652	691	1,182	616	576
7.........	628	303	358	466	318	385	392	436	487	1,248	1,061	476	465
M............	465	280	567	531	323	395	375	609	489	864	732	475	470
Group II													
1.........	542	......	301	392	450	321	194	507	415	1,758	......	491	471
2.........	730	250	682	629	357	610	525	523	381	2,110	......	299	592
3.........	815	......	521	748	645	453	315	553	407	......	......	457	538
4.........	......	242	420	793	429	423	470	473	513	982	......	379	472
5.........	592	298	423	535	496	433	784	515	264	1,061	292	396	466
6.........	......	216	732	619	533	465	524	806	560	2,320	......	647	641
7.........	753	760	485	592	685	492	679	510	416	......	778	329	531
8.........	441	245	460	567	264	451	504	506	335	......	......	455	438
9.........	301	......	492	514	331	352	302	508	573	1,010	......	347	435
10.........	690	......	464	565	308	493	468	507	308	1,144	......	409	485
11.........	531	420	400	457	348	409	373	572	439	492	......	328	429
12.........	689	238	502	629	168	507	245	672	450	413	420	589	526
13.........	409	980	480	658	329	443	430	526	431	1,488	......	496	489
14.........	611	......	581	557	210	416	254	480	555	1,379	......	435	499
M............	601	250	489	580	352	447	449	511	423	1,144	420	422	487
Group III													
1.........	......	......	525	529	293	396	417	439	......	2,333	......	462	470
2.........	344	705	498	549	475	545	448	474	600	705	......	335	497
3.........	......	......	555	623	442	256	......	618	398	......	......	332	457
4.........	336	......	300	387	181	308	492	402	......	......	......	209	313
5.........	392	372	568	602	240	......	252	560	80	875	......	324	405
6.........	......	......	303	175	......	......	......	325	352	846	......	240	323
7.........	144	......	320	330	333	269	......	217	316	......	......	176	248
8.........	187	213	334	293	508	213	......	334	......	480	......	355	318
9.........	160	......	170	105	280	188	212	195	......	......	......	104	179
10.........	639	255	706	850	301	572	293	565	......	1,575	......	442	608
11.........	......	300	143	240	160	136	213	136	......	125	......	214	160
12.........	305	1,333	500	453	212	124	160	551	355	1,706	......	533	444
13.........	170	......	449	620	161	340	......	483	338	......	......	381	407
M............	305	336	449	453	286	269	272	439	352	860	......	332	405

Table 11 shows this factor for each school, group, and subject. Reference to the right-hand total column shows that 480 is about the standard for schools of Groups I and II, and 405 for Group III. The variations between subjects within any school are far more marked than are variations between school totals. Here again, with the exception of music, the subjects that require the least work in preparation and correction seem to be the ones to escape with the lightest load.

NUMBER OF DIFFERENT SUBJECTS TAUGHT BY TEACHERS

Another important factor in the teacher's load is the number of different subjects which he or she is called upon to teach. The fewer the number of subjects and the more closely related they are, the less will be the daily work of the teacher in preparation

TABLE 12.—NUMBER AND PER CENT OF TEACHERS WHO TEACH ONE TWO, THREE, OR FOUR OR MORE DIFFERENT SUBJECTS

GROUP AND SCHOOL	Number teachers teaching 1 subject	Number teachers teaching 2 subjects	Number teachers teaching 3 subjects	Number teachers teaching 4 or more subjects	All	Per cent of teachers teaching 1 subject	Per cent of teachers teaching 2 subjects	Per cent of teachers teaching 3 subjects	Per cent of teachers teaching 4 or more subjects
Group I									
1....	29	......	......	......	29	100	......	......	......
2....	21	4	......	......	25	84	16	......	......
3....	20	5	......	......	25	80	20	......	......
4....	18	3	......	......	21	86	14	......	......
5....	18	1	......	......	19	95	5	......	......
6....	30	3	......	......	33	91	9	......	......
7....	48	5	......	......	53	94	6	......	......
Totals..	184	19	......	......	203	91	9	......	......
Group II									
1....	20	2	......	......	22	91	9	......	......
2....	9	3	1	......	13	69	23	8	......
3....	11	4	......	......	15	73	27	......	......
4....	5	3	......	......	8	63	37	......	......
5....	9	5	......	......	14	64	36	......	......
6....	2	6	1	......	9	22	67	11	......
7....	12	5	1	......	18	67	28	5	......
8....	7	2	2	1	12	58	17	17	8
9....	5	4	1	......	10	50	40	10	......
10....	6	3	1	......	10	60	30	10	......
11....	12	2	......	......	14	86	14	......	......
12....	10	2	2	......	14	72	14	14	......
13....	6	5	......	......	11	55	45	......	......
14....	7	5	......	......	12	58	42	......	......
Totals..	121	51	9	1	182	66	28	5	1
Group III									
1....	4	3	3	......	10	40	30	30	......
2....	3	1	2	......	6	50	17	33	......
3....	5	3	......	......	8	63	37	......	......
4....	......	......	2	1	3	......	......	67	33
5....	1	3	1	......	5	20	60	20	......
6....	......	2	1	......	3	......	67	33	......
7....	......	1	2	1	4	......	25	50	25
8....	1	2	2	......	5	20	40	40	......
9....	......	......	3	......	3	......	......	100	......
10....	......	3	3	......	6	......	50	50	......
11....	1	1	......	2	4	25	25	......	50
12....	1	2	3	......	6	17	33	50	......
13....	2	4	......	......	6	33	67	......	......
Totals..	18	25	22	4	69	26	36	32	6

Table 12 shows the facts relative to the number of subjects taught by teachers in the schools covered by this study. The table, however, does not tell the whole story, for a teacher might be credited as teaching science (one subject), but the schedule might show this teacher teaching two or three sciences having but little in common. This latter condition applies more to the smaller schools than to the larger, and if taken into account would tend to increase the number of schools in that group showing a large per cent of teachers having four or more subjects.

This table shows clearly that the number of subjects per teacher increases as we proceed from the larger to the smaller schools. Ninety-one per cent of teachers in Group I teach but one subject; 66 per cent in Group II; and but 26 per cent in Group III. No teachers in Group I teach more than two subjects; 6 per cent in Group II; and 38 per cent in Group III.

TABLE 13.—AVERAGE NUMBER OF PUPIL ENROLLMENTS PER TEACHER

School	GROUP I			GROUP II			GROUP III		
	Academic	Special	Total	Academic	Special	Total	Academic	Special	Total
1.......	152	108	142	181	202	188	185	302	209
2.......	141	58	115	147	286	187	88	134	94
3.......	157	65	135	134	163	138	148	423	211
4.......	107	139	119	138	108	130	84	423	105
5.......	121	120	121	124	57	111	125	153	136
6.......	114	157	128	133	223	152	130	204	150
7.......	92	67	82	139	146	141	128	49	120
8.......	......	......	......	133	77	117	131	150	136
9.......	......	......	......	138	230	158	122	65	115
10.......	......	......	......	145	114	138	74	43	68
11.......	......	......	......	112	139	119	98	85	95
12.......	......	......	......	112	87	110	50	87	63
13.......	......	......	......	118	141	124	47	39	45
14.......	......	......	......	112	136	118	......	......	......
Med......	121	108	121	133	140	134	122	134	115

*Study hall enrollment is not included in this table.

NUMBER OF PUPILS INSTRUCTED

Table 13 shows the average number of pupil enrollments in the classes of each teacher in each school and group. The tabulation omits individual subjects and gives the results for those subjects when grouped together as academic (English, history, Latin, mathematics, modern language, science) and special subjects (commercial, drawing, household arts, manual arts, music, and physical training). If music were omitted the number in the special subject column would be much reduced. Another reason for the higher number under "special" is that many of these classes meet but one or two periods a week. This increases the number of enrollments for these teachers if they teach approximately the same number of periods weekly as teachers of academic subjects. The numbers indicated in Table 13 are from 10 to 50 per cent greater than those reported by Monroe for Kansas schools.

COMPARISON OF STUDY HALL AND INSTRUCTIONAL COSTS

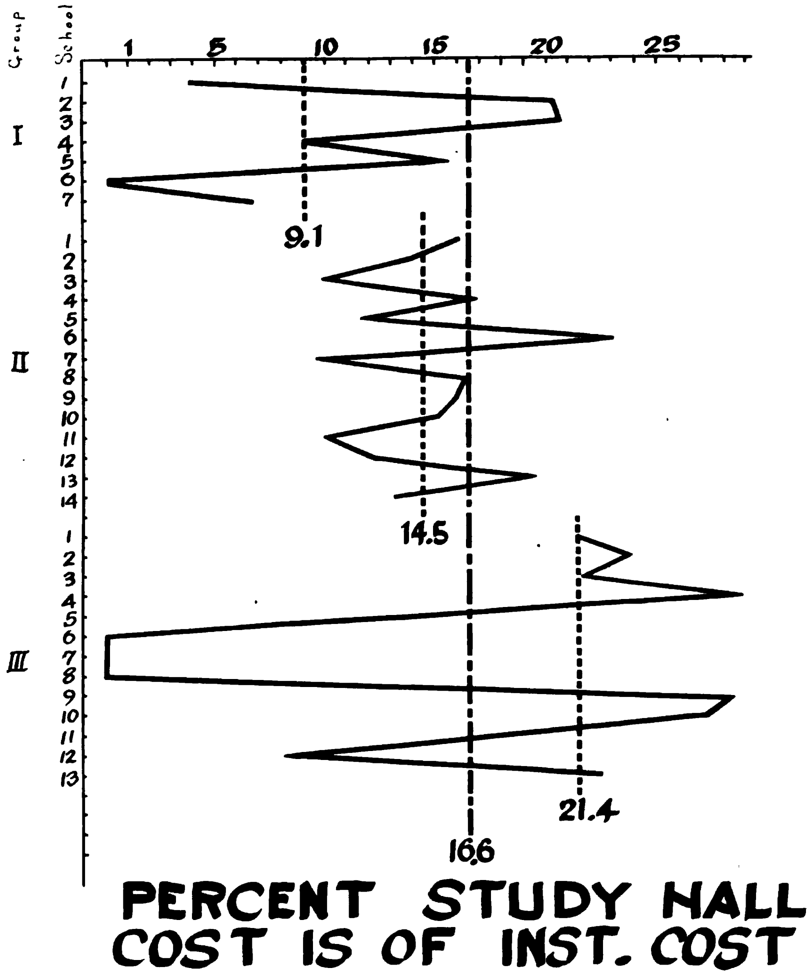
As indicated previously in this report, study hall cost has been included in instructional costs. As several schools did not report the number of pupils in their various assembly study periods, the study hall cost per 100 pupil-hours could not be computed.

TABLE 14.—PER CENT THE STUDY HALL COST IS OF INSTRUCTIONAL COST AND AVERAGE SIZE OF STUDY HALL GROUPS*

School	GROUP I		GROUP II		GROUP III	
	Per cent cost	Average size of class groups	Per cent cost	Average size of class groups	Per cent cost	Average size of class groups
1	4† (45)	60† (16.0)	16	66	21	X
2	20	38	14	91	24	47
3	20	50	10	113	22	77
4	9	167	17	74	29	30
5	16	56	12	132	14	44
6	40	18.2†	23	79		
7	7	120	10	135		
8			16	91		
9			16	X	29	X
10			15	85	27	58
11			10	71		
12			12	61	8	42
13			20	61	23	X
14			13	91		
Median	20	50	14.5	85	21	45.5

*Class groups marked (x) were reported without indication of size.
†Supervised study. Approximate results.

Table 14 and Figure 7 show the per cent the study hall cost is of the actual instructional cost, and the average size of the study hall groups so far as reports were complete. The study cost percentage increases in no marked degree from the larger to the smaller schools, being 20, 14.5, and 21, respectively, for the schools of Groups I, II, and III. There are also great variations within the schools of any one group. For example, the schools of Group II show a variation from 10 to 23 per cent and in Group III from 0 to 29 per cent. Several schools of Group III report no assembly study groups. As the normal pupil carries 4 subjects daily, and as the usual program has 7 or 8 daily periods, it is improbable that any school is without study groups. However, in some of these schools these study groups sit in rooms where classes are reciting, and hence the teacher's weekly schedule as reported to me credits the teacher with a recitation class and not with a study group. Two schools of Group I, one having no assembly cost and the other having but 4 per cent, are operating on a supervised study basis and the time has been charged directly to instructional cost. With a proper division of time between study and recitation these figures should be 40 per cent and 45 per cent, respectively.



PERCENT STUDY HALL COST IS OF INST. COST

FIG. VII.

The problem of better direction of study is receiving much attention among high school administrators. The plan generally in vogue at the present time of large assembly groups under the direction of one teacher, who is present for the maintenance of order, has not yielded satisfactory results. The plan of doubling the time of the usual class periods, using one-half for recitation and the other one-half for supervised study, has not been employed extensively because of its prohibitive cost.

Table 14 indicates that present practice favors study groups of from 55 to 60 pupils each in schools of Group I, but with a range of variation from 16 to 167. Schools of Group II favor a median study group of 85 pupils with a variation from 61 to 135. Group III has a median of 45 with a variation from 30 to 77. Only the most successful teachers are able to keep 50 or 60 pupils at effective study; and in large groups including the preparation of many subjects, it is apparent that no one teacher can give any effective supervision to study hall work.

In my judgment, where study hall cost approximates 20 per cent of the instructional cost, a school would do well to seriously consider introducing some plan of effectively directed study. Instead of 40-minute periods for recitation only, 60-minute periods could be substituted for combined recitation and study, and the class groups could be increased somewhat in size over the present standards in most of the schools of Groups I and II. Under the present plan of work, teachers in Groups I and II average 6 recitation periods a day, and have in addition one period daily assigned to study hall and another to conferences with pupils, or a total of eight periods or about 6 hours a day. Under the proposed plan each teacher would have not to exceed 6 1-hour periods daily with assembly and conference periods eliminated. With a 20 per cent increase in class size the number of daily classes could be decreased to 5 with the present teaching force. It seems possible by proper administrative readjustments to increase the effectiveness of school study by careful direction without increasing the burden upon the teacher or increasing the burden of cost to the taxpayers. The high school at Richmond, Ind., has been operating on a 65-minute basis during the present year without any increase in cost. The instructional and study cost for this school is exactly the median for schools of Group I, as may be seen by consulting Table 1 or Figure 3.

It may be found on trial that carefully supervised study during the ninth and tenth years will be sufficient to develop good and lasting study habits, and that in the eleventh and twelfth years pupils may do satisfactory work in large assembly study groups as at present. The Joliet (Ill.) township high school operates on this basis.

THE PROGRAM OF STUDIES

The ordinary school program shows merely what subjects are offered and gives no indication of the number of credits attempted in each subject, which is the value attached to these subjects by the pupil or community.

life, is a negligible quantity, having a percentage of 0 for the median in Groups II and III and but 1.2 in Group I; third, that drawing and art receive too little emphasis to realize either their cultural or vocational values; fourth, that the so-called pre-vocational subjects of household arts and manual arts have not yet usurped to any considerable degree the place of the traditional subjects. Latin seems to be giving way to modern language in the larger schools (Group I), but it has a distinct lead in the schools of Groups II and III. Owing to the peculiar conditions in school 5 of Group III (the median case in modern language) 6.7 (the average) should be substituted for 1.5 (the median) to represent adequately the work attempted in this subject. The group medians for commercial work probably represent a reasonable demand upon the high school program, but it may be seriously questioned whether a 15 to 20 per cent allotment of credits to this subject as reported from several schools is in all cases a proper demand. Even the industrial centers need no such proportion of workers trained along these lines. As a result, we are making these commercial courses a preparation for the blindest of blind alley jobs, and are being treated to the spectacle of graduates of our high school commercial courses competing for $4 a week positions. A considerable taking of certain commercial subjects as electives by students who do not expect to enter commercial employment may be justified because of the general utility of these subjects to the average man.

The small number of failures in all the special and vocational subjects in most schools gives rise to a suspicion, sometimes openly expressed, that the popularity of these courses is due to the ease with which students may earn their credits rather than to their recognized social values.

When the importance of the social and natural sciences for modern life is considered, the attention they receive in Group I schools is perhaps too little. If need be the English and foreign language departments could still afford to suffer a slight diminution of their glory in favor of these subjects which have as great cultural and disciplinary values, and greater social and practical values than the foreign languages.

While the group medians represent fairly well-balanced programs, many individual schools have a very faulty organization as judged by these median standards. This, in part, cannot be avoided in the smaller schools where only a limited number of subjects can be offered effectively. However, even here some balance should be maintained. In the smaller schools one foreign language should be sufficient, but many are attempting two, thereby giving undue emphasis to the language work and at the same time producing a high cost for instruction by operating a large number of small classes. In schools of Group III science, including agriculture, might well receive 15 or 20 per cent of the credits attempted.

As further examples of lack of balance in the program, several illustrations will follow. School 7 of Group III shows 33 per cent of its credits in foreign languages and but 4 per cent in science. School 5 of this group shows about 50 per cent more credits in English and history than its group standard and double the standard in music, but is giving language instruction to but 3 pupils, which represents 1.5 per cent of all the credits attempted by the school. School 6 of this group offers no work in one-half the subjects as classified in this report, and perhaps wisely so, but it is doubtful whether so much stress should be given to foreign language and music rather than to history and household arts. As this school is below the group median in costs, it might well afford to extend its offerings somewhat in departments of work not now offered. School 5 of Group I reported no offerings in commercial, drawing and art, music, or physical training. Coöperative arrangement with local commercial colleges might remove the need for offering the commercial courses in the high school, but in a school of this size all these departments should be represented on the high school program. The natural science column shows great variability in all three groups, which indicates a marked lack of standardization for a subject which has so long had a place on the high school program.

On page 25 of his report on costs in Kansas high schools, Monroe indicates the per cent of teaching time devoted to each subject of the program. This is desirable from the point of view of costs, but it affords no index of the actual credit values offered by subjects, which is the information desired by the administrator in reorganizing his program of studies. The medians of Table 15 indicate standards of curriculum organization in Indiana so far as we may be said to have developed any standards. Fig. VIII represents graphically these median standards.

At the end of the first semester supplementary forms were sent out to ascertain the number of credits attempted in each subject, the number passed, and the number failed, so that costs might be also computed on the basis of the number of credits passed, and standards determined for failure in the different subjects. As less than one-half the schools made this report, it has been impossible to treat adequately this phase of the investigation.

This investigation has been undertaken not to disseminate any predetermined opinions relative to high school costs and organization, but has been entered into coöperatively by the 34 schools for the purpose of gathering essential facts concerning high school costs and organization that each school administrator might have comparative data by which to check and guide his own practice.

The Measurement of Achievement in Algebra

HUBERT G. CHILDS

IN April, 1915, the research committee of the Indiana High School Principals' Association in conference with the writer decided to recommend a coöperative study in testing achievement in algebra. The writer assumed responsibility for the arrangement of the tests and the tabulation of data. Acknowledgements are due to Mr. J. Z. A. McCaughan of the Bloomington high school for assistance in the selection of the tests and determination of their preliminary arrangement.

A series of twelve tests was arranged, based largely on the Monroe tests which had been used in the schools of Kansas during the year. The Monroe tests were added to by the inclusion of tests in formal subtraction of polynomials (Test I), long division (Test IV), easy and difficult problems to be stated in the form of equations (Tests VII and XII), factoring (Test X), and solving simultaneous linear equations (Test XI). Test B of the Monroe series was slightly modified, and calls for the clearing of fractional equations of fractions (Test VIII). The following samples indicate the type of problems used in each of the tests. Where the problems of any test were recognized to be of unequal difficulty, the more difficult forms were introduced at regular intervals so as to have the results comparable whether a pupil completed 3 or 4 or 10 or 12 exercises in a given test.

Test I. Subtract. Time, 2 minutes.

$$\begin{array}{rrr} 10a & -\ 17b & +\ 240 \\ -3a & +\ 2b & -\ 100 \\ \hline \end{array}$$

Test II. Multiply and remove parenthesis. Time, 1 minute.

$\pm 4 (\pm 3x \pm 7)$

Test III. Solve for *x*. Time, 1 minute.

$\pm 15x = \pm 4.$

Test IV. Divide. Time, 6 minutes.

$$\underline{3x - 2}\,\big|\,\overline{-\ 3x^2 + 17x - 10}$$

Test V. Transpose terms. Time, 1 minute.

$-4x + 5 = 3x - 9$

Test VI. Collect terms. Time, 2 minutes.

$-53x - 10 - 115 - 40x =$

Test VII. State as an equation. Time, 4 minutes.

The sum of two numbers is 160. The greater is four times the less. Find each number.

Test VIII. Clear of fractions. Time, 3 minutes.

$$\frac{-7x-2}{6} = \frac{x+1}{8} - x$$

Test IX. Solve for x. Time, 10 minutes.

$$-\frac{3x-2}{4} = \frac{x+2}{6}$$

Test X. Factor. Time, 2 minutes.

$x^2 - 2x - 24$ (five type forms given).

Test XI. Solve for both unknowns. Time, 5 minutes.

$7x - 4y = 12$

$8x - 5y = 0$

Test XII. State as an equation. Time, 10 minutes.

The tens' digit of a number, expressed by two digits, is three times the units' digit. If the number, diminished by 33, is divided by the difference of the digits, the quotient is 10. What is the number?

In many respects these tests lack many of the characteristics of highly scientific tests. For example, the relative values of the different types of processes have not been determined, nor are all the examples under any one test of equal difficulty, nor do the examples under any one test form a graded series of steps of known difference of difficulty. All these defects are also apparent in the tests of Thorndike, Monroe, and Rugg. However, these tests have accomplished in part the immediate purpose of the coöperators, namely, the determination of a norm of achievement of certain types in first year algebra in Indiana high schools, within the limits of the tests and the small number of schools coöperating.

A uniform set of directions was sent out to each school giving the tests, and the tests were given in the several schools within two weeks of the completion of the term's work. The results show the usual wide range of variation between schools and between pupils of the same school and class.

Some teachers may object that these tests do not represent a fair measure of the algebraic ability of the pupils of a given school, since not all the processes tested are deemed of equal worth by all teachers and hence have not received equal emphasis and drill, while others more emphasized by some have been omitted. This objection is true in part, but such processes as are represented by Tests II, III, V, VI, VII, IX, and X are generally considered important and should receive such emphasis as to render these processes automatic and accurate at the hands of the pupils.

One objection to the tests as arranged is that the time required for their administration is too long. From this point of view the number of tests should be reduced to 7 or 8 thru the elimination of some and the combination of others. All possible processes cannot be tested in a general comparative test, but only a few of the most characteristic. In the interest of time economy the writer recommends the use of the following tests only for those schools wishing to compare their algebraic achievement with the norms indicated in this study: Tests II, III, V, VI, VII, IX, and X. These tests can be administered within the time limits of the usual classroom period of 40 minutes.

Ten schools, including 435 pupils, contributed to the results for the first semester's work in algebra and 5 of these with 5 others, 367 pupils, contributed the data showing the achievement at the completion of a full year's work. Several other schools have given the tests but they have failed to contribute their data to this coöperative study.

The writer has thought it best to reduce the results for each test to terms of achievement (attempts and rights) per minute as affording a better basis for the comparison of test with test and for summarizing the average achievement in several tests combined.

TABLE I.—ACHIEVEMENT IN FIRST SEMESTER ALGEBRA

Stated in terms of achievement per minute

No. of School	Test I				Test II				Test III			
	Attempts	Rights	Accuracy	Coefficient	Attempts	Rights	Accuracy	Coefficient	Attempts	Rights	Accuracy	Coefficient
1	3.35	.75	22	17−	6.50	5.00	77	385	6.90	3.00	43	129
2	3.85	2.75	72	198	7.60	6.90	91	628	8.60	6.70	78	523
3	4.05	1.65	41	68−	7.60	6.50	86	559	7.80	3.10	46	124
4	2.65	.65	18	12−	8.30	7.60	92	699	5.60	2.60	46	120
5	2.30	.70	30	21	8.60	5.00	58	290	6.50	1.50	23	35
8	3.55	1.55	44	68	7.30	5.90	81	478	6.90	3.30	48	158
9	4.30	2.70	63	170	8.10	7.20	88	634	9.10	8.20	90	738
10	3.20	1.50	47	71−	7.60	7.20	93	660	9.40	8.30	88	730
13	4.20	1.30	31	41−	7.90	6.70	85	570	6.50	3.30	51	168
15	3.90	2.75	71	196−	7.50	6.30	84	529	7.00	4.00	57	228
Medians	......	1.52	46	70	......	6.60	86	565	......	3.30	50	163
High	......	2.75	72	198	......	7.60	92	699	......	8.20	90	738
Low	......	.65	18	12−	......	5.00	58	290	......	1.50	23	35
Ratio High to Low	......	......	......	17-1	......	......	......	2½-1	......	......	......	21-1

Number of School	Test IV				Test V				Test VI			
	Attempts	Rights	Accuracy	Coefficient	Attempts	Rights	Accuracy	Coefficient	Attempts	Rights	Accuracy	Coefficient
1	.88	.29	26	6	4.70	3.50	74	259	2.95	1.95	49	71
2	.80	.38	48	18+	4.80	3.60	83	299	3.40	2.40	71	171−
3	.88	.40	45	18	5.90	4.70	80	376	3.20	2.05	65	134−
4	1.38	.45	33	16	5.40	4.80	89	429	3.75	2.65	71	188
5	1.12	.20	18	4−	4.50	1.30	29	38	3.00	1.60	53	85
8	.82	.35	43	15	4.70	4.30	92	396	3.90	1.90	49	93
9	.87	.48	56	27	6.20	5.90	95	561	4.20	3.40	81	276−
10	.67	.38	58	22+	5.00	4.60	92	423	3.45	2.85	83	237−
13	.75	.45	60	27	5.20	4.40	85	374	3.05	2.00	66	132
15	.90	.42	47	20−	4.30	2.50	58	145	4.00	3.00	75	225
Medians	......	.39	47	18	......	4.50	83	375	......	2.22	68	152
High	......	.45	60	27	......	4.80	89	429	......	3.40	81	276
Low	......	.20	18	4−	......	1.30	29	38	......	1.95	49	71
Ratio of High to Low	......	......	......	7−1	......	......	......	11−1	......	......	......	4−1

Number of School	Test VII				Test VIII				Test IX			
	Attempts	Rights	Accuracy	Coefficient	Attempts	Rights	Accuracy	Coefficient	Attemtps	Rights	Accuracy	Coefficient
1	1.65	1.10	67	74−								
2	1.52	1.20	79	95−	1.27	0	0	0				
3	1.35	.60	44	27−	1.60	.43	27	12−	.56	.16	29	5−
4	1.62	1.15	71	82	2.26	.83	37	31	.88	.26	31	8
5	1.30	.82	63	52	.43	0	0	0	.15	0	0	0
8	1.62	1.05	65	68+	.43	.20	14	3−	.53	.08	15	1+
9	1.69	1.12	67	76−	1.87	.53	29	15+	.73	.18	25	4½
10	1.55	1.32	86	114								
13	1.22	.80	65	52								
15	1.50	1.12	75	85−	1.57	.20	13	3−	.45	.09	20	2−
Medians		1.10	67	75−		.20	14	3−		.14	22	3+
High		1.32	86	114		.83	37	31		.26	31	8
Low		.60	44	27−		0	0	0		0	0	0
Ratio High to Low				3−1				X				X

Number of School	Test X				Average of First Seven Tests				Rank First† Seven
	Attempts	Rights	Accuracy	Coefficient	Attempts	Rights	Accuracy	Coefficient	
1	2.00	1.40	70	98	3.85	2.22	58	128	9, −
*2	2.80	2.00	71	142	4.29	3.42	80	272	3, +
3	2.90	1.50	52	78	.70	2.71	58	157	8, Av.
4	2.85	1.90	67	128−	4.24	2.84	67	190	5, Av.
5	1.65	.85	51	44	3.90	1.59	41	65	10, −
8	1.10	.40	36	15−	4 11	2.62	64	167	7, Av.
9	2.90	2.10	73	154−	4.92	4.14	84	348	1, +
10	2.20	1.90	86	164−	4.41	3.73	85	317	2, +
13	2.25	1.60	71	114−	3.95	2.71	69	186	6, Av.
15	2.70	1.75	65	114	4.16	2.87	69	198	4, Av.
Medians		1.68	68	114		2.77	68	188	
High		1.90	86	164		4 14	84	348	
Low		.40	36	15−		1.59	41	65	
Ratio of High to Low				11−1				5−1	

*Data incomplete for Test X. Estimate based on relative achievement in the first seven tests.

†"+", "Av.", "−", mean decidedly above average, average, decidedly below average, respectively.

TABLE 2.—ACHIEVEMENT IN FIRST YEAR ALGEBRA

Stated in terms of achievement per minute

Number of School	Test I				Test II				Test III			
	Attempts	Rights	Accuracy	Coefficient	Attempts	Rights	Accuracy	Coefficient	Attempts	Rights	Accuracy	Coefficient
2	4.05	2.50	62	155	8.60	7.60	89	676	10.7	10.3	96	989
4	4.05	2.25	56	126	9.10	6.80	74	503	9.50	5.50	58	319
6	3.60	1.40	39	55	7.10	7.00	98	686	8.80	5.40	62	335
7	3.50	1.75	50	88	5.40	4.30	79	340	5.10	.90	17	15
8	3.85	.75	20	15	8.20	7.40	90	666	10.7	6.20	58	360
11	3.25	1.60	49	79	6.70	6.30	92	580	6.30	1.50	24	36
†12	3.60	1.20	33	40	6.30	4.80	76	365	9.00	6.00	67	402
13	3.50	1.15	33	38	8.90	7.90	89	703	10.3	6.50	63	410
14	3.35	1.60	48	77	7.50	7.10	95	675	8.20	6.10	74	451
15	3.90	2.40	62	149	7.80	7.20	92	662	11.1	10.3	93	958
Medians	......	1.60	49	79	......	7.30	91	664	....	6.10	63	384
High	......	2.50	62	155	......	7.90	89	703	......	10.3	96	989
Low	......	.75	20	15	......	4.30	79	340	......	.90	17	15
Ratio of High to Low	......	......	......	10−1	......	......	......	2−1	......	......	......	66−1

Number of School	Test IV				Test V				Test VI			
	Attempts	Rights	Accuracy	Coefficient	Attempts	Rights	Accuracy	Coefficient	Attempts	Rights	Accuracy	Coefficient
2	.93	.55	59	33	6.10	5.20	84	437	4.25	3.35	79	159
4	1.22	.32	26	8	5.90	4.70	80	376	4.25	2.60	61	265
6	.80	.38	48	18	5.10	4.30	84	361	3.75	2.60	69	180
7	.68	.38	56	22−	4.90	4.10	84	344	3.40	2.10	62	130
8	.93	.47	50	23+	6.20	5.80	94	513	3.80	2.60	68	177
11	.80	.55	69	38	4.30	3.70	86	318	3.00	2.30	77	177
12	.60	.30	50	15	4.40	3.40	77	262	2.85	1.75	61	107
13	.82	.40	49	20−	5.50	5.0	91	455	3.90	2.90	74	215
14	.80	.42	52	22	5.20	4.90	94	461	4.20	3.65	87	318
15	.88	.47	53	25−	5.80	4.40	76	334	3.65	3.05	83	253
Medians	......	.42	52	22−	......	4.50	82	368	.....	2.60	69	178
High	.....	.55	69	38	......	5.80	94	513	......	3.65	87	318
Low	......	.32	26	8	....	3.40	77	262	......	1.75	61	107
Ratio of High to Low	......	......	......	5−1	......	.....	......	2−1	.....	..	......	3−1

Number of School	Test VII				Test VIII				Test IX			
	Attempts	Rights	Accuracy	Coefficient	Attempts	Rights	Accuracy	Coefficient	Attempts	Rights	Accuracy	Coefficient
2	1.45	1.08	74	80	2.17	1.17	54	63	.70	.38	55	21
4	2.02	1.40	69	97	2.93	.93	31	29	.88	.35	40	14
6	1.50	1.08	71	76	1.83	.93	50	47	.68	.23	33	8−
7	1.62	.89	54	47	1.83	.30	16	5−	.62	.15	24	4−
8	1.68	1.38	82	113	1.63	.73	45	33	.59	.24	41	10−
11	1.40	.62	45	28	......	......	......	......	......	......	......	......
12	1.58	.88	56	49	.77	.20	26	5+	.46	.13	27	3½
13	1.52	.92	61	57−	1.57	.77	49	38−	.43	.22	51	11+
14	1.82	1.35	74	100	1.73	.63	37	23	.70	.26	37	10−
15	1.60	1.18	73	86	1.97	.80	42	34	.78	.46	59	27
Medians	......	1.08	73	78	......	.73	45	33	......	.24	41	10−
High	......	1.38	82	113	......	1.17	54	63	......	.46	59	27
Low	......	.62	45	28	......	.30	16	5−	......	.13	27	3½
Ratio of High to Low	......	.....	......	4−1	......	......	......	13−1	......	......	......	8−1

Number of School	Test X				Test XI				Test XII			
	Attempts	Rights	Accuracy	Coefficient	Attempts	Rights	Accuracy	Coefficient	Attempts	Rights	Accuracy	Coefficient
2	2.30	2.05	89	183	.84	.48	59	28	.40	.08	20	2−
4	3.75	2.05	55	113	1.26	.76	60	46−	.78	.21	27	6−
6	3.15	3.00	95	285	......	......	......	......	......	......	......	......
7	2.90	2.40	82	197	......	......	......	......	......	......	......	......
8	2.80	2.65	95	252	.92	.48	52	25	.61	.08	13	1
11	......	......	......	......	......	......	......	......	......	......	......	......
12	1.45	.70	48	34−	......	......	......	......	......	......	......	......
13	2.65	1.90	72	137	.88	.24	27	6+	.31	.08	26	2+
14	2.80	2.45	92	226	......	......	......	......	......	......	......	......
15	3.10	2.75	89	245	.86	.46	53	24+	.39	.13	33	4+
Medians	......	2.40	82	197	......	.48	52	25	......	.08	26	2+
High	......	3.00	95	285	......	.76	60	46−	......	.21	27	6−
Low	......	.70	48	34−	......	.24	27	6+	......	.08	13	1
Ratio of High to Low	......	......	......	8−1	......	......	......	8−1	......	......	....	6−1

Number of School	Average All Tests				Average First Ten Tests				Average First Seven Tests				Rank First Seven Tests*
	Attempts	Rights	Accuracy	Coefficient	Attempts	Rights	Accuracy	Coefficient	Attempts	Rights	Accuracy	Coefficient	
2...........	3.54	2.89	81	235	4.12	3.42	83	283	5.15	4.37	85	371	1, +
4...........	3.80	2.32	61	142	4.36	2.69	62	166	5.15	3.38	66	223	7, Av.
6...........	......	......	......	......	3.63	2.63	72	190	4.38	3.16	72	227	6, Av.
7...........	......	......	......	......	3.00	1.73	58	100	3.51	2.06	59	121	10, −
8...........	3.49	2.40	69	165	4.04	2.82	70	196	5.05	3.51	70	245	5, Av.
11...........	......	......	......	......	......	......	......	......	3.68	2.37	65	154	9, −
12...........	......	......	......	......	3.10	1.94	63	122	4.05	2.62	65	170	8, −
13...........	3.36	2.33	69	161	3.91	2.77	71	197	4.92	3.54	72	255	4, Av.
14...........	......	......	......	......	3.63	2.85	78	222	4.44	3.59	81	290	3, +
15...........	3.49	2.79	80	223	4.06	3.29	81	267	4.96	4.13	83	343	2, +
Medians......	......	2.40	69	165	......	2.82	70	196	......	3.33	71	236	.....
High.........	......	2.89	81	235	......	3.42	83	283	......	4.37	85	371	......
Low..........	......	2.32	61	142	......	1.73	58	100	......	2.06	59	121	......
Ratio of High to Low......	......	......	......	2−1	......	......	......	3−1	......	......	......	3−1	......

*"+", "Av.", and "—", mean decidedly above average, average, and decidedly below average respectively.

"†" means data incomplete for Test I. Estimate based on relative achievement in the other tests.

EXPLANATION AND INTERPRETATION OF THE TABLES

The 15 schools contributing to this study have each been designated by a number at the left under the heading "No. of School".

Table 1 should be read as follows: first term algebra pupils in school No. 13 averaged 4.2 examples attempted in Test I; 1.3 examples right; 31 per cent accuracy; and made an efficiency coefficient of 41, in an average time of 1 minute.

As the number of examples worked right in a given time combined with the per cent of accuracy determines the efficiency of the pupil or the school, the writer has taken the product of these two factors as a measure of efficiency of achievement thruout this study. While the writer is not sure that this index is the most reliable one, it has the value of giving weight to both the underlying factors, tho perhaps not in the most desirable proportions. It also affords a single term expression in which to compare individual or school achievement. Reference to the ratio of high to low records in the tables will carry conviction that this coefficient as a comparative measure has not done violence to the situation. For example, in Table 2 under Test II the high score of 7.9 right and 89 per cent accuracy is, no doubt, twice as efficient a record as the low score of 4.3 right and 74 per cent accuracy. Reference to Test III of the same table would seem to warrant the conclusion that if one school can secure a result of 10.3 rights and 96 per cent accuracy, the low score of .9 rights and 17 per cent accuracy is worth almost nothing and may reasonably be considered to be only 1-66 as efficient a piece of work.

Medians in these tables have been computed from these efficiency coefficients, and the medians for "rights" and "accuracy" are the "rights" and "accuracy" which accompany the median coefficient.

As measured by these coefficients the 10 schools tested in Table 2 have relative efficiencies varying from 2½ to 1 in Test II, to 21 to 1 in Test III, and with a ratio between high and low of 5 to 1 for the first 7 tests combined. The ratios of efficiency in Table 2 vary from 66 to 1 in Test III to 2 to 1 in Tests II and V, with a ratio of 3 to 1 for the first seven tests combined.

In fairness to some of the schools represented, it should be stated that because of the small number of pupils tested in some cases (but 10 in school No. 7) the results may be somewhat erratic and not fairly represent the quality of achievement ordinarily secured in these schools.

By comparing its efficiency coefficient for each test with the median, and by noting in how many tests it exceeds, is equal to, or below the median, any school can determine its approximate rating with respect to the others. The last column in each table shows the relative ratings of each of the schools for average achievement in the first 7 tests combined. An inspection of Table 1 shows that school 1 is below the median in 7 of the 8 tests taken and is about average in Test VII, while school 10 is above the median in every one of the 8 tests taken. The rankings of these 2 schools for the first 7 tests combined are ninth and second, respectively. School 13 is about average in 4 tests, is above average in 2, and below average in 2, or, on the whole, is about an average school in algebraic achievement.

The average achievement per minute for first semester pupils for the first 7 tests combined is rights 2.77, accuracy .68, and efficiency coefficient 188. For pupils at the end of the first year in algebra the corresponding figures are 3.33, .71, and 236 respectively. This represents a gain during the second half-year of about 26 per cent in the more fundamental processes taken up in the first term. The per cent of gain in the more difficult processes which receive chief emphasis during the second semester, however, is but slightly greater.

Tables 1 and 2 show vast differences in achievement in the various tests for the same time limit. This is, no doubt, due to two factors: first, relative difficulty or differences in the number of processes involved; and, second, the greater amount of drill given to certain types of processes which may vary in a marked degree with different teachers. As an example of such variation, Table 2 shows a median for Test II of 7.3 rights and .91 accuracy, while Test XII has a median of .08 rights and .26 accuracy for the same time. An inspection of the tests reveals the fact that Tests II, III, V, VI, and X represent simpler processes and forms that commonly receive much drill, while IV, VII, VIII, IX, XI, and XII represent a complexity of processes or reasoning ability in which the same degree of speed and accuracy may not be expected.

To answer the problem, to what extent the poor results of some of these schools are due to combining poor scores in unimportant, and hence unemphasized, processes with good results in the more important processes, certain comparisons between two schools of high achievement and two of low achievement are made for each of the first 7 tests from Table 2. Schools 2 and 15 are taken to represent high and 7 and 11 low achievement. An inspection of the table shows that school 2 scores very high in Tests I and III; above average in IV, V, and VI; and average in II and VII. School 15, very high in I, III, and VI; and average in II, IV, V, and VII. School 7 scores very low in II and III; below average in VI and VII; and average in I, IV, and V. School 11 scores very low in III and VII; below average in V; average in I, II, and VI; and very high in IV (one of the least important processes). With the exception of school 11 in one test it will be observed that the schools ranked high are average or high in all tests, while those ranked low are average or low in all. If we assume that the native algebraic ability of pupils in one school is probably equal to that of those in another, we must clearly attribute these differences in achievement to differences in the quality and effectiveness of the instruction in the different schools.

The value of measuring achievement thru coöperative standard tests should lie in making each teacher and school conscious of his or its shortcomings as revealed by comparison with others, and should lead to careful investigation to locate the source of weakness, and should further lead to such modification of subject-matter and method as will yield more efficient results. The standard test should be the best means of constructive supervision.

COMPARATIVE RESULTS IN OTHER STATES WITH SIMILAR TESTS

Comparative data are scarce. The tests given in Illinois last year by Mr. Rugg have Test I similar to Test II of this series, Test IV similar to our X, and VII to our IX. The following comparison shows the approximate achievements, the Indiana results being reduced to an average in place of the median to conform to Mr. Rugg's data:

NUMBER OF TEST	INDIANA		ILLINOIS	
	Rights	Accuracy	Rights	Accuracy
II	6.64	88%	6.36	77%
IX	.27	42%	.23	31%
X	2.22	80%	1.19	53%

It will be noted that the most marked difference is in Test X, which deals with factoring. This difference may be due to some difference in difficulty of the two tests used, but a cursory inspection of the two reveals no marked differences of difficulty.

The Monroe tests have types equivalent to our II, III, V, VI, IX, and VIII. Mr. Monroe's results have been reduced to the median per minute basis in this comparison.

NUMBER OF TEST	INDIANA		KANSAS	
	Rights	Accuracy	Rights	Accuracy
II	7.3	91%	7.65	90%
III	6.1	63%	6.2	65%
V	4.5	82%	3.55	76%
VI	1.08	73%	2.33	67%
VIII	.73	45%	.67	37%
IX	.24	41%	.2	33%

The most marked difference in this comparison is in Test VI, collecting terms, which is clearly to our disadvantage. The Indiana results are somewhat superior in Tests V, VIII, and IX.

If the same tests were used and the same conditions observed in their administration, we should, no doubt, find the schools of different States securing approximately equal results in algebra or any other subject in which achievement should be measured, if a large number of schools be chosen.

MOST COMMON ERRORS OF PUPILS IN ALGEBRA

Professor Monroe and Mr. Rugg have carefully analyzed the typical errors made by pupils in the tests given by them, and the results of the two investigations are so much in agreement that it seems unnecessary to make a similar analysis for our test papers for we should, no doubt, find the same conditions.

The investigators, named above, have found errors in the use of signs, particularly the minus sign, to be the most prolific source of inaccuracy. This applies to all types of processes where the minus sign is used. The second most common source of error was inaccuracy in the fundamental processes of arithmetical computation; the third, mistakes in copying terms; the fourth, a closely related factor, the omission of terms, particularly x, the unknown, the value of which was to be found. Other conspicuous errors were the leaving of results in incompleted form, as $-x = 7$, and an inability to deal adequately with fractional forms.

LIMITATIONS OF THE INVESTIGATION IN ESTABLISHING COMPARATIVE NORMS OF ACHIEVEMENT IN ALGEBRA

The limitations of the types of tests used and the selection of exercises to make up each test have been referred to at the beginning of this article. There yet remains to be considered the reliability of the administration of the tests by each school and the accurate recording and tabulation of results.

The writer did not give the tests in person, but sent out uniform directions to be followed. Under the circumstances coaching for the test might have been possible had any teacher coöperating so desired. Personal acquaintance with the principals of the schools concerned and with many of the teachers, together with the results reported, give no ground for suspicion in this respect. It should also be stated that each school scored its own papers.

However, as a check, papers were called for from three schools and inspected. The per cent of errors found in scoring these papers was found to be very small, and of such a nature as to have no appreciable effect upon the tabulated returns which had previously been made. The writer is responsible for all comparative tabulations.

FURTHER INVESTIGATION

Further investigation is to be made to ascertain if there is agreement among algebra teachers as to what six or eight processes are most typical and significant for the first year work. Following this, two types of scales are contemplated: one containing several problems of equal difficulty under each test type, and to be given on the time limit basis (the present series of tests revised), the second to consist of a graded series of problems of three or four levels of difficulty under each test type and to be used chiefly for diagnostic purposes in analyzing the level of achievement of each pupil. This latter type of test has marked advantages as a basis for drill exercises in every important and minor process. Mr. Murray Dalman, of the Manual Training high school, Indianapolis, has done some good pioneer work in this respect.

In conclusion, the writer wishes to state that this investigation was undertaken to determine tentative norms only in certain types of algebraic achievement, and trusts that these results may be of some value both to the coöperators and to others who may care to make comparative tests. The achievement of the best schools is, perhaps, a better norm to work toward than the median results.

A Study of Enrollment, Acceleration, Retardation, and Normality in High Schools

HUBERT G. CHILDS

DURING the year 1915 age-grade forms were sent to the members of the Indiana High School Principals' Association from whom nine replies were received. Separate forms were used for promoted, non-promoted, and withdrawn pupils to ascertain whether any significant differences would be apparent among these groups with respect to normality, acceleration, and retardation. The number of replies is too limited as a basis for standards, but the data as herein tabulated may be suggestive of possibilities of comparison.

The 4 cities listed under Group I range in population from 7,000 to 30,000, and the five in Group II from 500 to 4,000.

The data were taken from the school records of the first semester of the year, and the ages were recorded as for January 31. The normal age for the ninth grade was taken as 15 years, i.e. from 15 up to 16. The high school grade classification was determined as follows: ninth, 0 to 6 credits, inclusive; tenth, 7 to 14; eleventh, 15 to 22; twelfth, 23 to 31. Promotion, non-promotion, and withdrawal were determined by the status of the pupil at the close of the semester at promotion time.

TABLE 1.—PERCENTAGE ENROLLMENT OF HIGH SCHOOL PUPILS BY SEX AND GRADE

Group and School	GRADE AND SEX											
	IX			X			XI			XII		
	Boys	Girls	Total	Boys	Girls	Total	Boys	Girls	Total	Boys	Girls	Total
Group I												
1	31.5	24.6	27.6	27.1	30.8	29.1	23 7	21.4	22.5	17.5	23.2	20.7
2	49.1	43.6	46.4	29.6	28.2	28.7	10.5	12.8	11.7	10.6	15.3	13.0
3	38 0	34.9	36.4	27.8	36.7	32.2	17.6	15.2	16.4	16.7	13.4	15.0
4	35.5	41.9	39.3	26.9	22.3	25.2	23.0	21.0	21.8	14.4	14.7	14.5
Group II												
1	34.1	33.3	33.7	36.6	26.5	30.6	14.6	21.1	18.4	14.6	19.3	17.3
2	44.4	26.6	35.1	28.4	22.8	25.6	16.0	22.8	19.5	11.1	27.8	19.5
3	11.8	35.3	19.6	44.1	23.5	37.3	23.5	29.4	25.5	20.6	11.8	17.6
4	39.0	31.2	34.6	30.5	28.6	29.4	22 1	14.3	17 6	8.5	26.0	18.4
5	30.6	38.6	33.8	38.8	30 0	35.2	16.5	14.0	15.5	14.1	17.5	15.5
Medians	35.5	34.9	34.6	29.6	28.2	29 4	17.6	21.0	18.4	14.4	17.5	17.3
*Indiana	36.1	33.9	35.0	26.2	26.4	26.3	20.8	21.9	21.4	16.9	17.7	17.4
*United States	42.8	39.2	40.8	26.6	26.8	26.7	17.8	19.3	18.7	12.8	14.7	13.9

*Report of U. S. Commissioner of Education, 1914, Vol. II, p. 420.

TABLE 2.—PERCENTAGE OF ACCELERATION, RETARDATION, AND NORMALITY BY GROUPS

Group and School	STATUS												
	Accelerated				Retarded				Normal				Within one year Normal
	*Prom.	NonP.	Wdrl.	Total	Prom.	NonP.	Wdrl.	Total	Prom.	NonP.	Wdrl.	Total	Total
Group I													
1	45.7	12.0	30.9	40.0	36.4	78 0	69.3	44.4	17.9	10.0	4.9	15.6	72.4
2	14.8	26.3	3.7	14.3	58.8	52.6	79.4	62.3	23.1	21.0	18.5	23.0	70.0
3	56.7	17.9	14.3	49.0	28.6	64.3	78.6	35.8	14.6	17 9	7.1	14.5	76.2
4	60.1	21.6	42.9	53.8	21.6	56.8	28.6	27.1	18.2	21.6	28.6	19.0	90.7
GroupII													
1	57.0	60.0	66.7	53.1	19.4	57.1	0.0	21.3	23.9	42.8	33.3	25.5	86.8
2	39.2	50.0	30.0	38.7	31.5	0.0	23.4	30.0	30.4	50.0	50.0	30.6	85.6
3	45.6	66.7	0.0	45.1	21.7	33.3	0.0	21.5	32.6	0.0	100.	33.3	76.5
4	37.6	0.0	0.0	32.4	43.6	81.8	87.5	49.3	18.8	22.2	12.5	18.4	75.8
5	37.9	50.0	33.3	37.3	26.5	25.0	83.3	28.8	34.7	25.0	16.7	33.8	89.4
Medians	45.6	21.6	30.0	40.0	28.6	56.8	69.3	30.0	23.1	21.6	16.7	23.0	76.5

*Prom. means promoted; Non-P., not promoted; Wdrl., withdrawal.

Table 1 should be read as follows: In school No. 1 of Group I, 31.5 per cent of all boys enrolled are in the ninth grade; 24.6 per cent of the girls; and 27.6 per cent of all pupils.

Table 2 should be read thus: In school No. 1 of Group I, 45.7 per cent of promoted pupils are accelerates; 12 per cent of non-promoted pupils are accelerates; 30 per cent of withdrawals; and 40 per cent of all pupils. 36.4 per cent of promoted pupils are retarded; 78 per cent of non-promoted pupils are retarded, etc.

Table 1 indicates that the median for these nine schools is approximately the same as that for Indiana as a whole. The distribution of pupils in Indiana schools is more satisfactory than in high schools of the United States in general in that the percentage is higher in the third and fourth years and lower in the first year, thus indicating a greater holding power. School No. 2 of Group I, which has apparently the poorest record of the nine, is undergoing a rapid growth in attendance (about 50 per cent in one year), which accounts for the large enrollment in the ninth grade and the low enrollment in the twelfth grade. Here it is not so much a rapid loss at the upper end of the course as it is a rapid growth at the lower end that causes the apparently poor showing. School No. 1 of Group I shows a remarkable holding power, which may in part be explained by the fact that it is in a college town.

The original data collected show the facts for each grade and for boys and girls separately with respect to acceleration and retardation. It should be mentioned that with almost no exception the girls have a higher per cent of acceleration and a lower per cent of retardation in every school and grade than the boys. This indicates that whether we have consciously designed it or not our schools are better adapted for securing the progress of the girls than of the boys. However, the status of the pupil in the high school may be entirely due to forces operating in the elementary school and not to the high school conditions at all. To determine the accelerating or retarding influence of the high school we should need the progress records of pupils in the high school.

An inspection of the data of Table 2 shows great variations between schools with respect to the same factor; for example, 14.8 per cent of the promoted pupils in school 2 of Group I are accelerates, and 58.8 per cent are retardates, while in school 4 of the same group 60.1 per cent of promoted pupils are accelerates and 21.6 per cent retardates. The median results indicate that

45.6 per cent of promoted pupils are accelerates and 28.6 per cent retardates. This record is much better than that usually found in the elementary school and is no doubt due to the fact that the majority of retardates have been eliminated on reaching years of voluntary attendance.

It will be noted that the non-promoted group has the lowest per cent of accelerates and the withdrawals the highest per cent of retardates. These data suggest a close relation between retardation and non-promotion and withdrawal.

The table shows that 40 per cent of all high school pupils are accelerates, 30 per cent are retardates, and 23 per cent are normal. A further computation of data indicates that 76.5 per cent of pupils are within one year of normal.

Per Cent of Failures in High Schools

HUBERT G. CHILDS

AT the same time as indicated above, blank forms were sent to the same schools asking for data relative to enrollments, repeaters, withdrawals, number remaining, failures, and promotions by subjects, to which the same schools responded and two additional, Nos. 5 and 6 of Group I, both of the 25,000 population city class.

In this report the group classification is the same as above, and medians have been computed for each group and for all eleven schools combined.

A portion of the data has been summarized in the accompanying tables under these heads: (1) per cent of failures by departments; (2) per cent of failures by years; (3) per cent of failures in certain first year subjects.

From each of these tables it will be observed that the per cent of failures is greater in every case in the schools of Group I. This may be accounted for in two ways: first, the close personal contact of patrons with the schools in the small communities leads to fewer failures as a means of avoiding friction and difficulty; and, second, the small size of classes and the close personal contact of pupil and teacher in these smaller schools should result in more individual stimulation and direction and fewer failures.

Every table shows a great excess of failures of boys as compared with girls in nearly all schools, grades, and subjects. Even in mathematics, supposedly a boy's subject, the girls surpass the boys in eight schools, equal them in one, and have a higher per cent of failures in but two schools (Table 1). In Table 2, the total median shows 11.1 per cent failure for boys, 5.5 for girls, and 8.5 for both combined. Table 3 shows that only about one-fourth as many girls as boys fail in first term algebra, one-half as many in first term botany, two-thirds as many in first term English, one-sixth as many in first term German, and one-third as many in first term Latin.

TABLE 1.—PER CENT OF FAILURES BY DEPARTMENTS (ALL YEARS)

Group and School	DEPARTMENT								
	English			Foreign Language			Mathematics		
	Boys	Girls	Total	Boys	Girls	Total	Boys	Girls	Total
Group I									
1	22.0	8.6	14.5	20.3	7.0	12.7	21.8	11.9	16.4
2	9.6	7.4	8.5	22.4	11.8	17.1	11.9	17.2	13.9
3	7.8	2.7	5.1	22.5	4.3	11.6	21.1	19.3	20.2
4	25.0	11.3	17.0	23.9	5.4	11.9	22.4	4.8	13.2
5	23.7	14.5	18.7	38.7	30.1	33.7	25.7	15.9	20.8
6	7.9	4.5	6.3	23.3	7.2	15.3	22.1	22.1	22.1
M	15.8	8.0	11.5	22.9	7.1	16.6	21.9	16.5	18.3
Group II									
1	15.4	0.0	6.3	42.4	11.7	23.8	20.0	0.0	9.6
2	5.1	1.3	3.2	23.3	6.2	15.3	14.5	6.9	10.6
3	0.0	0.0	0.0	4.5	0.0	2.8	23.0	9.9	18.1
4	9.6	5.6	7.3	13.5	5.6	8.5	13.0	6.7	9.9
5	7.5	5.6	6.7	5.7	0.0	3.0	8.6	10.0	9.2
M	7.5	1.3	6.3	13.5	5.6	8.5	14.5	6.9	9.9
Total Medians	9.6	5.6	6.7	22.5	6.2	12.7	21.1	10.0	13.9

TABLE 1—Continued.

	DEPARTMENT								
	Practical Arts			Natural Science			Social Science		
	Boys	Girls	Total	Boys	Girls	Total	Boys	Girls	Total
Group I									
1	7.3	9.1	8.1	11.4	3.9	6.3	19.0	7.6	11.6
2	3.8	6.4	5.3	13.8	6.4	9.6	9.6	2.2	5.9
3	4.9	0.0	2.5	22.2	0.0	9.8	24.5	6.7	15.0
4	9.6	3.2	6.6	19.0	7.4	12.5	18.7	1.0	8.8
5	9.8	8.3	8.9	16.8	16.3	16.7	10.7	14.2	12.9
6	8.8	3.3	4.4	8.8	0.8	5.1	2.5	2.2	2.3
M	8.0	4.8	6.0	15.3	5.1	9.7	14.7	4.5	10.2
Group II									
1	3.2	1.8	2.3	16.5	0.0	4.5	19.2	2.8	9.7
2	0.0	2.3	1.5	6.4	4.5	5.8	10.8	9.7	10.1
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	10.8	.3	9.4	5.4	7.4	6.6
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
M	0.0	0.0	0.0	6.4	0.0	4.5	5.4	2.8	6.6
Total Medians	3.8	2.3	2.5	11.4	3.9	6.3	10.7	2.8	8.8

TABLE 2.—PER CENT OF FAILURES BY YEARS (ALL SUBJECTS)

Group and School	GRADE											
	IX			X			XI and XII			All*		
	Boys	Girls	Total	Boys	Girls	Total	Boys	Girls	Total	Boys	Girls	Total
Group I												
1	16.9	10.1	13.1	30.7	13.2	20.6	14.5	2.7	7.3	16.2	8.2	11.6
2	16.1	11.9	14.2	10.5	13.1	11.6	16.8	0.0	8.3	11.1	8.2	9.7
3	16.1	9.6	12.2	25.9	14.4	19.3	12.6	2.9	7.8	12.1	5.5	9.6
4	32.2	10.0	17.1	19.8	2.3	10.3	15.7	4.3	10.0	19.9	5.9	12.0
5	40.1	22.8	32.2	12.6	19.7	16.7	10.1	13.5	12.3	22.3	16.3	19.0
6	22.3	11.5	17.2	13.4	18.8	16.2	3.5	1.5	2.7	9.8	6.9	8.5
M	19.6	11.7	15.7	16.6	13.8	16.5	13.6	2.8	8.0	14.1	7.5	10.7
Group II												
1	38.1	1.3	14.6	17.4	10.0	13.2	17.6	0.0	7.9	14.9	2.6	7.3
2	17.8	4.7	12.1	7.7	8.0	7.8	6.8	5.0	5.6	9.4	4.4	6.7
3	13.1	0.0	6.2	0.0	5.5	1.5	0.0	0.0	0.0	2.4	1.3	2.1
4	19.3	10.8	15.1	8.6	4.7	6.4	2.8	3.3	3.1	6.5	4.3	5.3
5	4.3	5.3	4.8	5.9	5.1	5.6	4.3	0.0	2.8	4.5	3.8	4.2
M	17.8	4.7	12.1	7.7	5.5	6.4	4.3	0.0	3.1	6.5	3.8	5.3
Total Medians	17.8	10.0	14.2	12.6	10.0	11.6	10.1	2.9	7.3	11.1	5.5	8.5

*Practical arts are included under *all*, but not under IX, X, XI and XII.

TABLE 3.—PER CENT OF FAILURES IN CERTAIN FIRST YEAR SUBJECTS

Group and School	SUBJECTS														
	Algebra IB			Botany IB			English IB			German IB			Latin IB		
	Boys	Girls	Total	Boys	Girls	Total	Boys	Girls	Total	Boys	Girls	Total	Boys	Girls	Total
Group I															
1	14.6	16.2	15.4	0.0	7.7	5.3	9.3	8.3	8.9	13.8	9.4	11.5	33.3	0.0	13.3
2	4.5	5.0	4.8	35.7	11.4	18.4	7.6	3.3	5.6	19.5	10.0	11.3	39.2	16.2	25.4
3	32.1	24.3	27.7	.....	.....	.....	3.1	2.8	2.9	22.6	3.6	13.6	21.4	8.3	13.2
4	25.0	6.4	12.5	0.0	11.1	10.7	39.3	14.5	22.9	42.1	10.7	23.4	23.5	8.1	12.9
5	36.7	0.0	19.4	27.6	0.0	25.0	35.3	19.5	26.7	59.0	43.6	51.3	39.1	31.0	34.8
6	31.0	20.5	26.3	30.8	2.1	8.2	11.0	6.0	8.0	33.3	2.8	22.2	41.7	13.0	27.7
M	28.0	11.3	17.4	27.6	7.7	10.7	10.2	7.1	8.5	28.0	9.7	17.9	36.3	10.7	19.3
Group II															
1	35.7	0.0	15.1	0.0	0.0	0.0	23.0	0.0	9.6	50.0	0.0	30.4	100.	8.3	15.3
2	18.5	8.1	12.5	7.1	7.6	7.4	8.5	0.0	5.8	35.7	0.0	20.8	26.7	9.1	19.2
3	50.0	0.0	20.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.5	0.0	6.7
4	20.0	9.5	14.6	21.1	13.6	17.1	16.3	13.0	14.6	17.6	12.0	14.3	22.2	9.1	15.0
5	5.6	6.2	5.9	.....	.....	.....	5.7	12.5	8.6	6.2	0.0	4.0	0.0	0.0	0.0
M	20.0	6.2	14.6	3.6	3.8	3.7	8.5	0.0	8.6	17.6	0.0	14.3	22.2	8.3	15.0
Total Medians	25.0	6.4	15.1	7.1	7.6	8.2	9.3	6.0	8.6	22.6	3.6	14.3	26.7	8.3	15.0

Table 1 should be read as follows: 22 per cent of the boys, 8.6 per cent of the girls, and 14.5 per cent of both fail in English in School No. 1. Other tables are to be read similarly.

Every table shows a wide variation among different schools when compared with respect to failures by years or subjects. For example, Table 1 shows a range in Group I of 5.1 per cent to 18.7 per cent failures in English; 11.6 per cent to 33.7 per cent in foreign language; 13.2 per cent to 22.1 per cent in mathematics; 2.5 per cent to 8.9 per cent in practical arts; 5.1 per cent to 16.7 per cent in natural science; and 2.3 per cent to 15 per cent in the social sciences.

Table 2 for Group I shows a range from 12.2 per cent to 32.2 per cent for ninth grade failures; 10.3 per cent to 20.6 per cent in the tenth grade; 2.7 per cent to 12.3 per cent in the eleventh and twelfth grades; and 8.5 per cent to 19 per cent for all combined. Even greater variations are apparent between schools for failures in first term subjects. School 5 of Group I has a very high failure rate, 19 per cent for all subjects and years combined (Table 3), while school 3 of Group II has an exceedingly low rate, 2.1 per cent. School 5 of Group I reported a 59 per cent failure rate in first term German for boys and 51.3 per cent for boys and girls together. It would appear that the standards of this school would result in the elimination of many pupils. Census and enrollment data show this school to have a smaller per cent of its population in high school than any city of its class reporting for this study.

An inspection of the table shows that a wide variation also exists with respect to failures by subjects. Table 1 for Group I shows a range from 6 per cent for practical arts to 18.3 per cent for mathematics. This indicates that all subjects have not been equally well organized and standardized. Mathematics and the languages are responsible for a very large per cent of failures, in some cases including more than 50 per cent of all pupils, while in some schools all pupils are passed in practical arts and the special subjects. Here the time element seems to be the only requirement for passing. One sometimes becomes suspicious of the reasons given for the popularity of these courses.

In all respects in which these data have been compared, lack of fixed norms or standards is apparent. It is hoped that this summary, while not based upon extensive data, may be suggestive for comparative purposes.

Observations on the Teaching of First Term Algebra

JAMES Z. A. McCAUGHAN, of the Bloomington High School

THIS experiment was undertaken at the beginning of the first semester of the present school year. It was proposed to treat three sections of beginning algebra pupils under the same teacher by the three plans outlined below and to make comparison of results. The scheme was to be carried out in several high schools in the State, but seems to have failed of execution in other schools.

Section one. Pupils of this section were to have the ordinary plan of recitation and were to study when they pleased and as much as they pleased.

Section two. Pupils of this section were to have a divided recitation. About fifteen minutes of the time was to be devoted to general and personal instruction and the rest of the period to the ordinary testing out of the pupils' preparation of the lesson. These pupils were to study but one recitation period daily and that in the school study room. Altho there was an attempt made, the instructor found himself unable to control definitely and regularly the division of time in the recitation.

Section three. These pupils had the ordinary recitation and studied the period following under the supervision of the teacher. They were to have no other study time.

Section one recited at 1:00 p.m.; section two, at 1:45; section three, at 2:30. This made the study period for section three last from 3:15 to 4:00, the most unfavorable period of the day.

Previous to the division of these pupils into sections there was no attempt to classify them according to their record in arithmetic. The data on this point, given later in this report, were obtained after the close of the semester in algebra. With the purpose of making it easy to get the final arithmetic grades, pupils from the city schools were taken as far as possible for these sections. These pupils seemed to be representative of the ordinary eighth grade graduates, with the exception of one member of section three, who never made a passing grade in 8B arithmetic, and for whom a great amount of personal help seemed to do little good.

The grades of the repeaters in the three sections are such as to have no effect on the figures for the final results.

TABLE 1.—COMPARISON OF ALGEBRA SECTIONS

Sec. I recited at 1:00 p.m.; no limitations on study time
Sec. II recited at 1:45 p.m.; study time limited to one school period daily.
Sec. III recited at 2:45 p.m.; study period, 3:20-4:00 supervised.

Column	1	2	3	4	5	6								7	8	9	10	11	12	13
SECTIONS	Enrollment	Withdrawn	Present during whole term	Number rural school graduates	Number repeating first term Algebra	Ranking of pupils in final Arithmetic and Algebra grades								Medians of final Arithmetic grades	Medials of final Algebra grades	Average number of minutes of daily study	Number passing	Percent passing	Number not passing	Percent passing after making up conditions
						90-100		85-89		80-84		75-79								
						Arithmetic	Algebra	Arithmetic	Algebra	Arithmetic	Algebra	Arithmetic	Algebra							
Sec. I	27	3	24	8	1	7	7	6	7	6	2	5	2	85.5	86.3	39.1	18	75.	6	83.3
Sec. II	26	2	24	1	1	1	10	3	1	9	5	11	3	80.5	84.3	33.4	20	83.3	4	83.3
Sec. III	26	3	23	0	3	3	8	3	6	7	4	10	3	81.	86.	36.8	21	92.3	2	91.3
Total						11	25	12	14	22	11	26	8							

TABLE 2.—STANDING OF THESE SECTIONS AS DETERMINED BY THE INDIANA UNIVERSITY SCHOOL OF EDUCATION ALGEBRA TESTS

TESTS	MEDIAN OF ATTEMPT			MEDIAN OF RIGHTS			PERCENT OF ACCURACY		
	Sec. I	Sec. II	Sec. III	Sec. I	Sec. II	Sec. III	Sec. I	Sec. II	Sec. III
1. Subtraction	7.8	7.2	8.75	4.8	6.2	7.	61.5	86.1	80.
2. Multiplication from ( )	8.1	7.7	7.7	6.9	7.	7.3	85.2	90.9	93.5
3. One-process equations	10.25	10.4	8.9	6.5	7.7	7.5	63.4	74.	84.3
4. Division	4.8	4.8	4.9	2.4	2.1	2.25	50.	43.7	45.9
5. Transposing terms	4.5	4.2	4.4	3.5	3.2	3.7	77.8	76.1	84.1
6. Collecting terms	6.5	6.4	7.	3.9	4.6	5.	60.	71.8	71.4
7. Forming equations	6.9	6.8	6.1	5.1	5.3	4.9	73.9	77.7	80.3

A study of Tables 1 and 2 shows that section three excelled in almost all points of comparison. This might be expected where the size of classes was practically the same. This suggests that a better plan for making comparison of results would be to take 50 pupils in one section with a period of supervised study and compare the outcome with two sections of 25 pupils each without supervised study.

In the light of this experiment, does the double period with supervised study pay? If we consider the cost of instruction, we would say that it cost twice as much to accomplish a passing grade for 21 pupils in one section as it did for 20 pupils in each of two other sections. Against this is to be placed a small but clear gain in efficiency percentage, and a clear gain in number of pupils passed. The percentage of gain in number passing indicates that 7 or 8 of the 10 not passing in sections one and two might have been saved by supervised study.

Does supervised study pull up the weaker pupils and pull down the stronger? The number of pupils is too small in this experiment to warrant any assertion in answer to this question. Those who think that supervised study has a tendency to pull down the brighter pupils may get some indication favorable to their opinion by a study of the number in the highest rank of section 2 (column 6, Table 1) in connection with their number of minutes of daily study (column 9, Table 1).

The use of the Indiana University School of Education Algebra Tests (see Table 2) gives a means of comparing these sections in important details of their work. This table brings out clearly the strong places and the weak. All sections are strong in subtraction and weak in division, the operation in which we would expect the subtraction ability to help in producing better results. The fact that the "tests" tell the same story in favor of section 3 as do other modes of comparison tends to show that they are reliable as measures of the pupils' progress and as a means of comparing classes and schools.

In these days we are making great plans for predicting a pupil's course of study by what he has already done. Suppose that these pupils had been sectioned for algebra on the basis of their final grades in arithmetic. Columns 5, 6, 7, Table 1, show in one way how much mistaken we might have been. Only 25 per cent of the lowest one-third of algebra pupils would have been properly classified; 19 per cent of the middle one-third, and 52 per cent of the highest one-third.

TABLE 3.—FINAL ARITHMETIC GRADES

	Lowest Third	Middle Third	Highest Third
Number of pupils	25	26	21
Per cent staying in the same third in algebra	25	19.2	52.4
Per cent moving to a higher third in algebra	41.7	57.7	....
Per cent moving to a lower third in algebra	*33.3	23.1	47.6

*Pupils not passing in algebra.

Of the 12 failures in algebra, 2 were from the middle third in arithmetic; 10 from the lowest third. Of the 12 highest in algebra, 1 came from the lowest third; 7 from the middle third; and 4 from the highest third.

The Pearson's coefficient of correlation of final arithmetic and final first term algebra grades is +.458.

These comparisons seem to afford little encouragement for prophesying what a pupil may do. Cold figures take no account of the effect of increased age and development, new environment, new resolutions, and new motives for effort.

The Measurement of Reading in Indiana Schools (Abstract)

Melvin E. Haggerty, Professor of Educational Psychology, University of Minnesota.

The Thorndike reading tests were given in more than a score of Indiana cities in May, 1915. The results of these tests were sent to Indiana University and were there tabulated and comparative scores were made out. Additional tests were given in about twenty-five cities in December, 1915. These additional tests were given with a view to extending the original scales, making them serviceable over a wider area, and for purposes of re-examination after practice. The results of these tests show wide variations in reading ability in each of the several grades and among the classes of the same grade in the several cities. A complete report covering individual, class, and school scores for the several periods, the relations of sex, age, and time to the efficiency in reading, and a considerable amount of material on the extension of the scales is in preparation and should be available within a short time.

APPENDIX

Appendix

⁂This appendix belongs to the paper of Mr. B. R. Buckingham, p. 49.

MARCH TEST IN ARITHMETIC

1. If a map 10 inches wide and 16 inches long is made on a scale of 50 miles to the inch, what is the area in square miles that the map represents?

2. Cream is sold in half-pint bottles. If a milkman buys it at $1.20 a gallon and it costs 40 cents a gallon to bottle and deliver it, at what price per bottle must it be sold to gain 20 per cent?

3. A fruit dealer bought 300 apples at the rate of 5 for a cent, and 300 at 4 for a cent. He sold them all at the rate of 8 for 5 cents. What did he gain on the investment?

4. A family used 1½ bu. of potatoes a month. How much will be saved each month by buying them at $1.30 a bushel instead of at 8 cents a quart? (8 qts. = 1 pk.; 4 pks. = 1 bu.)

5. James buys papers at 10 for 6 cents and sells them at 1 cent each. If his sales average 100 a day for 6 days, what does he add to the family income after keeping $0.10 for himself?

6. The 7A class has 42 on roll and only 3 absent today; and the 7B class has 48 on roll with 4 absent. Which has the better percent of attendance and how much?

7. Bought pencils at $1.20 per gross, and sold them at 1 cent each. Find the gain per cent.

8. A family pays $25 a month for a non-heated flat and uses 5 tons of coal at $7 per ton for heating purposes during the winter. If they moved to a steam-heated flat at $30 a month, would they increase their expenses for the year or not, and how much?

9. The value of the men's factory products in the leading centers of the United States was as follows:

	1860	1900
New York	$17,011,370	$103,220,201
Baltimore	3,124,342	17,290,825
Boston	4,567,749	8,601,431
Chicago	540,709	36,094,310
Philadelphia	9,962,800	18,802,637

Find the increase or decrease in the value of the men's factory products in 1900 as compared with that of 1860.

10. Two boys made a gallon of lemonade, using 16 lemons at 30 cents a dozen and 2 pounds of sugar at 6 cents a pound. They sold it at 5 cents a glass, 6 glasses to a quart. How much was each boy's share of the gain?

JUNE TEST IN ARITHMETIC

1. A farmer has a herd of 12 dairy cows that average 22 pounds each of milk per day. The milk contains 3.8 per cent butter fat, and butter fat is worth 28 cents per pound. What is the daily income from the herd?

2. I am making a handkerchief out of a piece of linen 10⅜ inches square. If I make a ¼-inch hem all around it, how long and wide will it be when finished?

3. If Texas is 213.06 times as large as Rhode Island, and New York is 39.44 times as large as Rhode Island, then Texas is how many times as large as New York? Express to the nearest second decimal place.

4. According to the report of the Bureau of Census, the numbers of persons engaged in the different groups of occupations in the United States in 1880 and 1910 were as follows:

	1880	1910
Agricultural pursuits..........	7,713,875	12,567,925
Trade and transportation.....	1,871,503	7,605,730
Manufacturing pursuits.......	3,784,726	10,807,521
Professional services..........	603,202	1,825,127
Domestic and personal services	3,418,793	5,361,033

Find the total increase in the number of persons employed in the United States in 1910 over those employed in 1880.

5. A can of milk containing 40 quarts costs $1.60. What per cent is gained by selling the milk for 6 cents a quart?

6. I bought a cask of molasses containing 84 gallons for $28. Nine gallons having leaked out, at what price per gallon must I sell the remainder to gain $4.25?

7. A farmer's wife bought 2.75 yards of table linen at $0.87 a yard and 16 yards of flannel at $0.55 a yard. She paid in butter at $0.27 a pound. How many pounds of butter was she obliged to give?

8. A man and boy together spaded 9-10 of a garden. If the man spaded twice as much as the boy, what part of the garden did each spade?

9. A contractor completed ⅔ of a job in 12½ days. How much longer should it take to finish the job?

10. In a certain state the cost of building a macadam road is shared by the town, county, and state. The state pays ⅓, the county ⅙, and the town the remainder. If the state pays $1,200, what does the town pay?

MARCH TEST IN GEOGRAPHY

1. In what country is Berlin?
2. What is the capital of New York State?
3. What is the chief export of Brazil?
4. In what state is Paterson?
5. Name a railway system connecting New York and Chicago.
6. Name a leading state of the United States in the production of cotton.
7. Name a city that is in North Latitude and also West Longitude.

8. Through what city does the Prime Meridian pass?
9. What changes are caused by the rotation of the earth on its axis?
10. In what state is Pike's Peak?
11. Name an important export from Buenos Aires.
12. Name the three most important countries of South America.
13. From what is latitude reckoned?
14. What state is next north of Illinois?
15. What is the latitude of New York City?
16. In what city is Harvard University?
17. Name a city that is in North Latitude and also in East Longitude.
18. Name the six great powers of Europe.
19. South of the equaeor in what direction do the trade winds blow?
20. Through what waters would you pass in going from the Black Sea to the Atlantic Ocean?

JUNE TEST IN GEOGRAPHY

1. In what country is London?
2. What is the capital of the United States?
3. Name the six continents.
4. In what state is Baltimore?
5. Name the five Great Lakes.
6. Name the two principal mountain systems of North America.
7. Name the zones into which the earth is divided.
8. What river forms a portion of the boundary between Europe and Asia?
9. What circles bound the Torrid Zone?
10. Name a leading state of the United States in the production of wheat.
11. For what industry is Pittsburg noted?
12. What changes are caused by the revolution of the earth?
13. Name an important city on the Danube River.
14. What state is south of Utah?
15. How many degrees of latitude are there between the North Pole and the South Pole?
16. Name an important city on the Clyde River.
17. Name the cardinal points.
18. Name three public buildings in Washington, D.C.
19. How many miles (about) are there in a degree of latitude?
20. Name a city that is in South Latitude and also in East Longitude.

MARCH TEST IN HISTORY

1. In what war was the battle of Gettysburg fought?
2. At about what time was the first message sent by telegraph?
3. Name three American generals in the Revolutionary War.
4. What were two important problems facing the United States government during Jackson's administration?

5. State one important general plan carried out by the navy of the North in the Civil War.
6. Mention two of the principal weaknesses of the government under the Articles of Confederation.
7. Under whose administration was the Civil Service Commission established?
8. Of what political party was Alexander Hamilton a leader?
9. What problem gave rise to the Free Soil Party?
10. In general, what was the attitude of England towards the South during the Civil War?
11. What is the provision of the Constitution regarding the number of members in the Senate?
12. To what political party in England did most of the settlers of Virginia belong?
13. What conclusion should be drawn from the following statements:
    (a) The farms of New England paid poorly in 1800.
    (b) The New England streams furnished plenty of water power in 1800.
    (c) During the 50 years preceding 1800, new machines were invented that made manufacturing much more rapid and profitable and these could be operated by water power.

JUNE TEST IN HISTORY

1. Give the name of the treaty made as a result of the Revolutionary War.
2. When was the cotton gin invented?
3. What colony in America was founded by English Catholics?
4. In what year did government under the Constitution of the United States begin?
5. What is the main purpose of the Monroe Doctrine?
6. To what section of the United States did the Ordinance of 1787 apply?
7. In the Civil War the North was fighting to establish a great constitutional principle. What was that principle?
8. What condition in England led to the settlement of Georgia?
9. From what part of Europe did the great majority of immigrants come before the Civil War?
10. To what religious body did most of the settlers of Pennsylvania belong?
11. Give the substance of one amendment of the Constitution made as a result of the Civil War.
12. What critical problem arose during Buchanan's administration?
13. What conclusion may be drawn from the following statements:
    (a) In 1880 the manufactured products of the South were valued at $500,000,000, or one-eleventh of the total for the whole United States.
    (b) In 1900 they had risen to $1,500,000,000, or one-ninth of the totals for the whole United States.
    (c) In 1905 they were valued at $2,200,000,000, or one-seventh of the total for the whole United States.

MARCH TEST IN GRAMMAR

SEVENTH GRADE—FIRST HALF

1. Give the part of speech and the syntax of the underlined word in the following sentence:
   Certain birds nest in the vicinity of our houses.
2. Give an example, in a sentence, of a predicate nominative, and underline it.
3. Draw one line under the complete subject and two lines under the complete predicate in the following sentence:
   Down through the green leaves the sun was pouring his splendor.
4. Analyze: Now swiftly glides the bonny boat.
5. Write a sentence containing a relative pronoun in the objective case, and underline the word.
6. In the following sentence, give the case of the underlined word and state how it is used in the sentence:
   I gave him a letter for my friend, the attorney.
7. Give an example, in a sentence, of the positive degree of the adverb better and underline it.
8. Draw a line under all the nouns in the following passage:
   In winter I get up at night
   And dress by yellow candlelight.
   In summer, quite the other way,
   I have to go to bed by day.
9. Pick out the phrase in the following sentence and tell what it modifies:
   The windows were white with frost.
10. Underline all the pronouns in the following:
   I tell you he is a selfish fellow, one whose only thought is of himself. Those who have anything to do with him are likely to regret it.

JUNE TEST IN GRAMMAR

SEVENTH GRADE—FIRST HALF

1. Copy each underlined noun and write after it its number, gender, and case:
   Lafayette, the friend of Washington, was a French nobleman.
2. Use, in a sentence, a personal pronoun in the first person, plural number, objective case, and underline it.
3. How may an adjective clause be distinguished from an adverbial?
4. Underline the subject word once and the verb twice in the following sentence:
   The cold November rain is falling.
5. Write a sentence containing the comparative of ill, and underline the word.

6. Analyze:
   Ammonia is found in the sap of trees, and in the juices of all vegetables.
7. Write the feminine of lord, earl, tiger.
8. Make the necessary correction in the following sentence:
   I am sure it could not have been them.
9. Give an example, in a sentence, of an adverb of time, and underline it.
10. Write a sentence containing a noun phrase, and underline the phrase

MARCH TEST IN GRAMMAR

SECOND HALF OF SEVENTH GRADE TO SECOND HALF OF EIGHTH GRADE

1. Analyze the following sentence:
   Columbus did not know that he had discovered a new continent.
2. Make a list of the verbs in the following sentences and after each verb write its mode, voice, and tense:
   Cassius, be not deceived.
3. Death will certainly knock at every door.
4. The territory claimed by the English had been called New Netherland.
5. Write the principal parts of *sweep, drive, write.* In each of the following sentences select the subordinate clauses and tell the syntax (use in the sentence) of each:
6. Books were written that they might give pleasure.
7. I was reminded of those days when I had known neither care nor sorrow.
8. The children played that they were keeping house.
9. Write a sentence containing a relative pronoun in the objective case, and underline the word.
10. In the following sentence give the case of the underlined word and state how it is used in the sentence:
    I gave him a letter for my friend, the attorney.
11. Give an example, in a sentence, of the positive degree of the adverb better and underline it.
12. Draw a line under all the nouns in the following passage:
    In winter I get up at night
    And dress by yellow candlelight.
    In summer, quite the other way,
    I have to go to bed by day.
13. Pick out the phrase in the following sentence and tell what it modifies:
    The windows were white with frost.
14. Underline all the pronouns in the following:
    I tell you he is a selfish fellow, one whose only thought is of himself. Those who have anything to do with him are likely to regret it.

JUNE TEST IN GRAMMAR

Second Half of Seventh Grade to Second Half of Eighth Grade

1. Copy each underlined noun and write after it its number, gender, and case:

   Break, break, break!
   On thy cold gray stones, Oh, sea.

2. Pick out the verb in the following sentence and after it write its mode, voice, and tense:

   A shower has been brought on by the mild summer breeze.

3. Give an example in a sentence of a participle used as a noun and underline it.
4. Give an example in a sentence of an infinitive in the passive voice.
5. Write a sentence illustrating the use of few as an adjective pronoun (indefinite pronoun).
6. Give an example in a sentence of that used as a conjunction, and underline it.
7. Combine the following statements into a complex sentence containing but one subordinate clause:

   In May a sparrow built its nest. The sparrow had evidently met with disaster earlier in the season. It built its nest in a mass of woodbine. The mass was thick. The woodbine was near my window.

8. Write the first person, singular, of the following:

   Passive voice, indicative mode, present tense of the verb "lead".

9. Write a sentence containing the comparative of ill, and underline the word.
10. Change the following complex sentence into a simple sentence without altering its meaning:

    We saw that it was wise to give in.

11. Write the feminine of lord, earl, tiger.
12. Make the necessary correction in the following sentence:

    I am sure it could not have been them.

13. Give an example in a sentence of an adverb of time, and underline it.
14. Write a sentence containing a noun phrase, and underline the phrase.

PER CENT OF PUPILS ANSWERING EACH QUESTION CORRECTLY, 7TH AND 8TH GRADES COMBINED

Questions	Arithmetic		Geography		History		Grammar			
							7^1		7^2-8^2	
	March	June	March	June	March	June	March	June	March	June
1	20.0	33.6	97.5	98.9	93.9	85.1	13.7	33.5	23.9	63.9
2	39.5	16.1	94.0	96.4	61.1	90.1	46.6	42.8	9.7	34.3
3	60.0	65.7	77.7	88.8	50.3	58.9	46.5	44.3	30.0	61.5
4	50.7	78.2	88.3	88.4	15.3	65.6	36.8	62.3	12.6	19 9
5	52.3	80.8	67.1	82.4	54.9	43.1	18.9	34.3	45.9	55.0
6	40.2	45.2	66.3	88.3	35.9	50.5	17.0	7.3	27.9	57.9
7	68.1	65.7	75.6	77.9	13.9	32.9	6.3	7.4	25.9	12.0
8	46.6	55.3	71.8	61.9	31.0	32.3	23.3	20.4	32.3	9.0
9	57.9	45.4	60.2	64.7	19.7	15.3	29.9	61.1	25.3	44.4
10	51.9	49.6	60.2	65.2	64.8	79.7	11.3	25.0	28.6	3.9
11	....	....	38.8	42.4	42.8	67.1	....	....	6.7	19.8
12	....	....	68.6	43.0	14.1	26.6	....	....	36.7	33.9
13	....	....	55.1	53.4	....	....	....	....	38.6	65.8
14	....	....	26.7	39.7	....	....	....	....	22.0	46.1
15	....	....	38.4	51.0	....	....	....	....	....	....
16	....	....	24.2	48.3	....	....	....	....	....	....
17	....	....	35.3	34.9	....	....	....	....	....	....
18	....	....	43.3	24.1	....	....	....	....	....	....
19	....	....	7.8	19.2	....	....	....	....	....	....
20	....	....	12.8	28.4	....	....	....	....	....	....

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Fourth Conference on Educational Measurements

APRIL, 1917

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FOURTH ANNUAL CONFERENCE
ON
EDUCATIONAL MEASUREMENTS

Held at Indiana University, Bloomington, Ind.,
Friday and Saturday, April 20 and 21, 1917

PUBLISHED BY
THE EXTENSION DIVISION OF INDIANA UNIVERSITY
1917

"Any business man who is managing a business in which he expects to make profits will have standards from which he will work. He will have measuring sticks to test the efficiency of his output; he will have units of accomplishment; he will have cost accounting systems; and he will have standards of many kinds. He will also have a continual system of testing and working over what he is doing, to find out whether what he is doing is the best that can be done with the money he has at hand, and whether the output is as large as he could well produce with the work and money he has to invest in it.

"In the business world the business man is continually facing the question of justifying his work to his stockholders. The stockholders demand profits; they want to know whether the business is being efficiently managed; and if the work is not being efficiently managed, as determined by the percentage of profit on the common stock, they demand that there shall be some reasons given to them why it is not paying, or else that there shall be a change in the management of the enterprise. . . .

"In our school work very often we have nothing of that kind. Our specifications are not always dictated by the needs of the future; too often they are framed by those who are thinking in terms of the past. We have no unit-cost accounting systems; we do not continually measure the output. An age and grade distribution sheet for almost any school system would show a very large amount of waste in the process of manufacture."—ELLWOOD P. CUBBERLEY, in *Proceedings of Indiana University Conference on Educational Measurements*, 1916.

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Foreword

THE fourth annual conference on educational measurements has still continued in part the lines of discussion inaugurated in the three previous conferences relative to the measurement of achievement in certain school subjects. This is particularly true in arithmetic and reading.

The two studies on the measurement of arithmetical abilities in Indiana published in 1915 and 1916 by Dr. Melvin E. Haggerty have stimulated a third survey in arithmetic in which twenty-seven towns and cities participated, the complete results of which will soon go to press. A brief report of the study by Dean H. L. Smith given at the conference has been incorporated in this bulletin.

A further study on the measurement of oral and silent reading by the use of the Gray Oral and Silent Tests was begun under the direction of the Bureau of Coöperative Research at the first of the year 1916-17. Miss Cecile White gave a brief summary of the results at the fourth conference. Professor W. S. Gray, author of the tests, was secured to write an interpretation of the data received from the schools. The complete report of the study is now in press.

Two other important reports of investigations were submitted to the conference; one by Professor W. W. Black on a study in handwriting, and another by Calvin P. Stone on educational research at the Indiana State Reformatory.

Professor W. F. Book in his address gave the conference a vision of the vast opportunities for experimental work as yet untouched in Indiana. Professor R. J. Leonard expressed the conviction in his address that standards in the new field of vocational education were essential.

Two practical demonstrations in the administration of tests formed another interesting feature of the conference. Professor C. H. Judd illustrated with the lantern the giving and scoring of reading tests, while Professor G. D. Strayer demonstrated the use of his score card for school buildings and equipment by scoring the Bloomington High School.

The following motions were seconded and carried at the Saturday afternoon session, April 21:

(*a*) A motion to express by a rising vote of thanks the appreciation on the part of the conference of the interest the University took in providing so well for its physical and general welfare.

(*b*) A motion that the conference go on record as being in favor of coöperating in every way possible with the organized forces of this state in any movement that looks toward the using of boys and girls in the great conservation movement carried on at present in the United States.

(*c*) A motion to adopt the resolution that the conference recommend that the State Superintendent and the President of the Indiana

State Teachers' Association appoint a committee of seven members of which the State Superintendent and the President of the Indiana State Teachers' Association will be *ex-officio* members, whose duties will be to look after the interest of education in the new constitution.

Before adjournment the conference expressed its appreciation of the service rendered by the University in promoting the conferences, and particularly of that rendered by the Bureau of Coöperative Research in fostering the spirit of coöperation in the state in the scientific measurement of educational achievement.

Introductory Address

William Lowe Bryan, President of Indiana University

It is not my purpose to make an address but only to extend to you the heartiest welcome to Indiana University on this occasion.

I feel, as I suppose you all do at this time, that every question has to be considered in connection with the war in which we are engaged. This war was forced upon us. In the presence of this situation, we ought to mobilize every force that there is in this country for the strongest possible conduct of the war. So far as the University is concerned, our first business is to use all of the resources that are here in support of the government. At the same time, I think it is highly important that we should not think nor act hysterically. We should act with the cool judgment that a great commander uses in the thick of the battle itself. We are in danger of doing things that are foolish and ineffective. We should consider every line of action in the light of the best experience which the world affords, and the world affords a good deal of experience with reference to the conduct of the educational interests, while the war is in progress. The belligerent countries have realized that they have made great mistakes in the neglect of their children during the war.

There was held in Albany, N.Y., about a week ago a conference of persons who are interested in vocational education. There were present representatives of seventeen states. A representative of the Canadian government emphasized the fact that Canada had made serious mistakes in neglecting the children, and in encouraging children to work more hours than they should. They said, "We are in a war for our lives and we must make every sacrifice and everybody must help. The children must work, and we must relax the law with reference to child labor." The result was that they had very gravely injured large numbers of children.

This is a very good illustration of the peril in which we stand in this matter. It was patriotic, it was noble, it was heroic, but it wasn't wise; it wasn't good fighting.

I had a communication the other day from the National Society of Child Labor, an organization which has been very effective in ameliorating the laws with reference to child labor. The officers of this society were sending out the warning to us who are members of the society that we should not make the mistake of sacrificing the children unduly in the emergency that is before us.

This is not to say that we should not organize better than ever before the children of proper age for work. I believe that we should do so, I believe that we must do so. Our Mr. Kendall has organized an industrial army in New Jersey. Boys of certain ages are organized and are given badges or uniforms, and are trained to work in agricultural activities or in industrial activities.

What I have meant to say is that we have no more important business at the present time than to consider with the utmost care what we are to do in our schools and with our children that will be best for the country and at the same time will not involve the sacrifice of the children. I revert to the proposition which I laid down in the outset, that the most important business of all of us is to meet this great and dreadful crisis with all our might. I think very likely it will require all our might before we get thru with it. But at the same time, at every step we should avoid hysteria; we should avoid being carried away in a panic which is not justified by the facts and by the conditions. We should try, in a word, to do what the great general does in the thick of the battle, to direct all the forces that we have with the utmost economy, as well as with the greatest wisdom in order to accomplish the result.

I have not discussed in any way the philosophy of this war. We are in it and we will likely be in it for a good while, and while we are gathered here together in counsel in regard to these special matters of such very great importance, our thought should turn constantly to the great crisis that confronts our nation and the world.

The Scoring of School Buildings

G. D. **Strayer**, Professor of School Administration, Teachers College, Columbia University

We have been spending millions and hundreds of millions of dollars in the United States for school buildings. We will continue to spend other hundreds of millions of dollars for school accommodations. We have allowed persons who call themselves architects, and sometimes school architects, to put up for us the sort of a building that they thought would stand as a monument to their memory. Sometimes they build us an Italian palace, at other times it is a Greek temple, and occasionally a medieval castle, and more recently, and fortunately, we occasionally get a good school building.

The purpose of scoring school buildings is not simply to discover our mistakes. It is rather and most importantly to discover what sort of a plan the architect proposes, and to check against this plan what might be considered standard requirements for school buildings. The score card then is of use, and the idea of scoring school buildings is legitimate in terms of going over the plan of a school building, and asking of that plan that it meet the requirements which may be reasonably laid down.

If you will look at the heading Detailed Score Card for City School Buildings on the score card (see Appendix), you will notice that the first topics are accessibility and environment. It is even suggested that the density of population and protection from noise and dust are to be considered.

There is a very modest requirement that there be thirty square feet of playground for each child. I suppose in most of the cities in Indiana you have two hundred square feet of playground for each child. You ought to have that much, if you can afford it. In the larger cities we cannot afford it, and we ordinarily have less than the thirty feet suggested.

Has it ever occurred to you that if someone were to consider carefully the problem of a site before the building is located; if someone were to study carefully the question of trend of population so that he could estimate not simply the present density of population, but the expectancy with regard to population; if one could figure as the telephone company figures where it is going to need more lines fifteen years from now; if one could determine, as the building contractor or the promoter does, where population may reasonably be expected to go, a building program could be made which would, when completed, furnish accommodations for the children? That is what is suggested in the first section of the score card. It does not pay simply to say, "Here is a piece of land that someone wants to sell: we are going to put up a building;

we can fill it if we locate it here." We need to inquire carefully with respect to the location.

In this discussion I want to tell you of two situations in which I have recently worked. One was a small New England city in which the citizens had the problem of putting up one or two new school buildings. The town was quite naturally divided as to the proper location of those buildings. The one side of the town, they called it the South Side, wanted the building, and the North Side naturally enough wanted it, too. They were going to determine by vote where to locate the building.

It was a perfectly simple thing in such a situation to make a study of the density of population and to discover that there was only one place in that city, a small city, where a building might reasonably be placed, taking into consideration lines of transportation, where the people were, where the developments were coming. If you wanted a building that was going to last for fifteen or twenty years, you had to put it there, and you could not listen to the kind of discussion which was to be found on the street with respect to the desirability of giving to one section which has not had all that it wants, this new building.

The location of a school building is an important factor to be determined by the facts that are pertinent to the location of that building. When a survey is made the result may be expected to be as in that New England town—in a unanimous vote in the town meeting for the location of the building where it belonged. But I cannot dwell upon any feature of the score card at this stage of our discussion. Suppose we go on to the question of building, meaning in this case the gross structure.

I have been fortunate enough, or unfortunate enough, to discover that school buildings are quite commonly placed on sites which are provided for them, with little or no reference to the use to which the building is to be put. It is not uncommon, when the streets of a Middle Western city run north and south, and east and west, to have the building located that way, so that half of the rooms facing the south are overwhelmed with light, so that there is always the difficulty of shutting out light and of raising and lowering the shades, usually not properly raised or lowered, so as to give the shadows in one part of the room and the excess of light in another part. Where the site is as large as it ought to be there is no excuse for locating the building in that way.

It ought to be located so that all of the rooms would have some sunshine; it ought to be built across rather than with the points of the compass. The score card suggests it; it appears reasonable to one who stops to think about it. One might expect that the architect would accommodate himself to the idea that it is important to locate his building with respect to all of the rooms, and with respect to the fact that children are to be found in all of them, at work, all of the days of the year. It is even suggested here that there is a rule or that there are conditions to be fulfilled with respect to entrances, corridors, stairways, and the rest.

Do you know that there are buildings being constructed at this time that are costing $10,000 a room, in which the very simple expedient of making the building safe for children is forgotten? That is, the builders make them, as they call them, fireproof, and the buildings are not fireproof because they will burn up if they get a chance, while if a fireproof stair well had been built, which is the standard of construction for a building in which a large number of persons, especially a large number of children, are to be housed, practically perfect protection would have been obtained.

During the month of February I went into a building in a large Middle Western city where I discovered an expensive building which had wonderfully beautiful fire escapes on the outside, and I said to the principal, "You use these fire escapes once a week for dismissal?" He said, "No, we could not possibly; there isn't a child in this school who would dare to go down those fire escapes." I went out on the fire escape to discover how it was constructed and found there a very unique arrangement of a bar so that you could not possibly tramp on it without being tripped. It was a rectangular piece of iron, and the sharp edge, the corner, was stuck up! That was the surface you walked on, so that your heel would catch, or your toe would trip. You could not go down that fire escape with any suggestion of safety. So simple a detail as that the architect or the man who wants to sell a fire escape of a particular brand forgets. Have you ever forgotten anything like that in the construction of a building? The difficulty is that when the plans come, and when the detail is presented for your consideration, you look for all of the things that you remember, and there are many details that you do not remember.

There are many details that go or ought to go to make up a good building, which at the time that the plans are presented for your consideration—at the time that you give your O.K. to the school board—you should have in mind.

I need not go on with the score card, then, in order to suggest that its primary purpose is to call attention to all of the details which go to make up the satisfactory building so that anyone who is charged with any degree of responsibility for the construction of the building can check against each item of that building while it is still in the stage of being planned.

If one had time to run thru the score card, as it appears here (see Appendix), he would find a discussion, for example, of service system, fire protection, cleaning, artificial lighting. I cannot pass artificial lighting without stopping for a minute. There are buildings in which artificial lighting is being distributed in such a way as to give twenty-five foot candles at some desks in the room on a dark day or on some nights when the building is in use, while at other desks in the same room the light is so inefficient that it is practically impossible to use that part of the equipment.

Apparently someone has figured that it would take so many candle power to illuminate a certain area; then he did not take into consideration the distribution of that candle power so as to light each desk. You say it is an obvious, simple thing. No one should neglect to place those lights, preferably three in a row, and three rows of them, and keep them to the side of the room where the desks are, if one aisle is larger than the other, and yet half of the schoolrooms in which I have been during the past year in which artificial lighting has been provided are not so distributing the light which they provide.

If you will look in the last number of the *School Board Journal*, you will find that the architects and persons who are supplying certain kinds of equipment point with pride to the buildings recently constructed, and if you will take the trouble to look at those buildings you will discover that many of them are ugly and possibly not properly lighted by virtue of the fact that the architect thought that he had to distribute windows evenly over the entire wall surface of his building. He could not get away from the idea that if he had a room with three sides he must distribute windows over those three sides more or less regularly placed.

I went into a series of buildings built in a community that is considered very progressive, and discovered that in every building, altho there was unilateral lighting, the builders had, in every case, placed the windows on the side which carried the solid bank of windows right up into the front corner, and I discovered that every child in the room looking at that corner of the blackboard had to look right into the window that was alongside of it—and all in the name of providing adequate lighting for the children in that room!

"Why," said the man who took me around to see that building, "we have a ratio of 1 to 4," and he would have been much better off if he had a ratio of 1 to 6, as much as I am inclined to think that is not quite enough lighting in this latitude. The detail of the score card, the idea of a standard check against the program for building, a check against it in terms of location, of the sort of site to be provided, of every detail of the building to be constructed, is most important.

It seems to me to be just a sort of common sense or efficiency, or whatever else you choose to call it, that those of us who believe in efficiency in education ought to indulge in.

It is interesting with the score card in mind to find out what happens when it is used. The first question is, "How do you arrive at the value which you attach to the various elements which go to make up your complete or your total score?" The answer which is the only answer that I know how to give to the first question is this: Men who have been responsible for the organization and administration of schools, men who have been responsible for the construction of school buildings, men who have given attention to the question of what makes an efficient school building, will, if they are asked to exercise their judgment, value one element as either more or less important. So the procedure in assigning weights to the various items of the score card was to get approximately five hundred superintendents of schools, and others interested in school architecture, to weigh values, to say how many points out of the thousand they would allow to each of the several items which go to make up the total score. And then, of course, you find the variation in judgment, but the judgments center, that is, there was a central tendency. The man who is extreme in either direction is probably not so nearly right as those men who are to be found agreeing.

In other words, we took the median score and said, "That is satisfactory."

For fear someone may object to that method, I hasten to say that it makes no particular difference what weight you assign to any element, because in the scoring of your building or in the study of the problem as presented by the score card you have to isolate each item, and ask, What is the situation in this school system with respect to this element in the building? What is the situation with respect to this plan as it has to do with fire protection? What is the situation in this plan as it has to do with the lighting of classrooms? and so on thru the whole list, so that if you had arbitrarily said that you would give one hundred points to each and every item on the score card, and then had said

TABLE I

SCORES OF TWO BUILDINGS

	HAWTHORNE				VAN BUREN			
Scorer's No.	6	9	12	*Median*	8	9	10	*Median*
Items I	85	71	83	83	90	88	111	93
A	45	30	45	45	45	40	51	45
B	20	26	23	23	25	28	30	28
C	20	15	15	15	20	20	30	20
Items II	94	113	91	101	81	98	80	88
A	15	22	16	16	20	22	22	22
B	44	36	26	36	34	35	26	34
C	35	55	49	49	27	41	32	32
Items III	116	123	115	125	149	148	119	135
A	31	32	30	31	32	60	27	32
B	0	8	9	8	15	9	12	12
C	13	15	16	15	12	16	17	16
D	0	0	0	0	9	1	6	6
E	5	15	15	15	15	4	9	9
F	15	2	5	5	19	10	13	13
G	42	41	35	41	40	43	26	40
H	10	10	5	10	7	5	9	7
Items IV	174	186	187	179	171	154	178	173
A	35	25	25	25	20	10	15	15
B	49	67	60	60	46	64	57	57
C	47	50	56	50	60	30	53	53
D	20	20	16	20	10	10	15	10
E	23	24	30	24	35	40	38	38
Items V	111	78	75	85	70	80	61	80
A	45	28	35	35	30	27	8	27
B	28	13	10	13	25	19	18	19
C	38	37	30	37	15	34	35	34
Total	580	571	551	573	561	568	549	569

that each particular item is up at the top, or that it falls down, you would have been just as well off as I am by saying I am going to call this a thousand points and then distribute in terms of the median score as allowed by those who know what school buildings ought to be. But it is interesting to discover whether or not men who use the score agree, because if the measurement is good, there ought to be some sort of an agreement; that is, we ought to approach each other in the values assigned to the same plan or to the same building.

In the accompanying Table I you will find two buildings, each of which was scored by three individuals without consultation, and each of whom scored the building on a different day, so there could be no collusion; they could not have gotten together and decided; they would agree or disagree.

If you care to look over it, you will discover that the remarkable thing, possibly, is the fact that they come together pretty well all the way thru and that their totals range 580, 571, 551. If you can get an instrument that will work within that degree of variability, it is about as good as any of the instruments that we use with respect to any of the school work that we are undertaking.

I think it is fairly satisfactory, and so for the second building you find the scores running 561, 568, 549, and again I think, as evidence, it shows that it is possible for people to learn. These people were not untrained; they read the bibliography at the end of the score card; they talked over the scoring of buildings; they had thought about the matter of giving weight, of subtracting from the total which might be allowed.

If you will notice Table II in which the percentage allotment is given, if you are studying the problem from the standpoint of a group of buildings already constructed, you have this issue: What is the present efficiency of the plant? More and more it seems to me in both the large and small school systems we must ask ourselves that question, Where do we stand?

With respect to the efficiency of the plant that we have in operation, I do not think I am violating confidences at all when I suggest that St. Paul from this table (II), as it appears here, is in a most deplorable state. If you will take heating and ventilating, there are three buildings that got out of the total score which might be allowed for heating and ventilating less than 26 per cent of that score. There are thirty-six buildings with less than 51 per cent out of the total score which could be allowed for that element entering into the school building. Of course, one does not depend simply upon this score. One does not make this score out of whole cloth. What did we do? We went in on a cold day and found out what the temperature was at 8:30, 9:30, and 10:30 o'clock. We discovered rooms so cold that children had to leave, and it was just normal winter temperature for St. Paul. We found rooms drier than the Sahara Desert, and I do not hestitate to say that, because there are records to show that the Sahara Desert is not so dry as many of the schoolrooms in St. Paul.

We discovered that for fire protection there were thirty-nine buildings which received a score less than 36 per cent of the total number of points which could be allowed for fire protection.

We found a basement with a boiler carrying a pressure of twenty-five pounds (some of you men know what that means when you are running a low-pressure boiler at twenty-five pounds), and a wooden stairway without handrails the one exit from the basement. If that boiler ever exploded, no one would ever get out of that basement. In another school building we discovered a can of kerosene, some rags, and some trash under the only stairway that led from the second floor.

There is not in the city of St. Paul, except in, I think, four or five of their newer buildings, a fireproof furnace-room, or heating-plant room, and yet fire insurance men tell us that 90 per cent of the fires in schoolhouses originate near the heating plant in the basement.

TABLE II

THE PERCENTILE DISTRIBUTION OF THE EFFICIENCY OF CERTAIN FEATURES OF THE SCHOOL BUILDINGS OF ST. PAUL

(Under the percentages is given the number of buildings scoring within the range of percentage stated)

	0 Per cent to 25 Per cent	26 Per cent to 50 Per cent	51 Per cent to 75 Per cent	76 Per cent to 100 Per cent
Heating and Ventilating System	3	36	11	3
Fire Protection System	29	16	4	4
Toilet System	1	7	29	16
Water System	24	22	4	3
Large Rooms for General Use	5	41	7	0
Cleaning System	0	9	29	15
Artificial Lighting System	28	16	8	1
Internal Structure	1	15	26	11
Gross Structure	1	7	30	15

Are you at work in a school system in which the heating plant is not isolated by fireproof partitions? If you are, you are simply courting disaster, and that is what one gets when he goes into the situation and asks what is the efficiency of the present school plan.

Go on to the water system. In St. Paul there are twenty-four buildings which have less than 26 per cent of the points allowed. It is not possible for most children in the city of St. Paul to wash their hands; there is not a place to wash their hands. If they want a drink they go and stick their mouths over the faucet and get the water that way.

Now, of course, there is nothing so desperately bad as that in any of your communities. Your state law does not permit it; neither does the Minnesota law permit it. It just was. It is not what the law says. Probably if you are not very careful many of you have paid good money to install drinking fountains which are so constructed and so fed that every time a youngster wants to get a drink from that drinking fountain he puts his mouth down over the particular spot from which the water emerges and gets his drink. A school building with such arrangements for drinking is not any better than the first schoolhouse, where the good old-fashioned drinking-cup was passed around.

TABLE III

ST. PAUL'S ELEMENTARY SCHOOLS ARRANGED ACCORDING TO RANK

1.	Lafayette	313	26.	Garfield	576
2.	Jefferson	358	27.	Hawthorne	579
3.	Monroe	404	28.	Douglas	580
4.	Adams	409	29.	Davis	582
5.	Jackson	427	30.	Scheffer	582
6.	Franklin	452	31.	Longfellow	586
7.	Webster	491	32.	Washington	587
8.	Rice	500	33.	Harrison	607
9.	Crowley	500	34.	Deane	608
10.	Lincoln	511	35.	Smith	613
11.	Hendricks	516	36.	Whittier	613
12.	Irving	521	37.	Sheridan	615
13.	Murray	524	38.	Grant	617
14.	Cleveland	530	39.	Ramsey	627
15.	Edison	531	40.	Tilden	627
16.	McClellan	535	41.	Baker	643
17.	Maxfield	538	42.	Hill	661
18.	Neill	538	43.	Galtier	681
19.	Hancock	541	44.	Phalen Park	687
20.	Drew	543	45.	McKinley	700
21.	Sibley	549	46.	Mound Park	710
22.	Gorman	550	47.	Gordon	712
23.	Ericsson	558	48.	Ames	792
24.	Madison	563	49.	Finch	927
25.	Van Buren	569		Total	27,983
				Possible	49,000
				Percentage	57.1

It is interesting to go into your plans; it has been interesting, I am sure, for some of you, to find out what you had to check against, and it ought to be interesting to some of you, it seems to me, to make the plans for reconstruction and re-equipment which are called for by these very moderate demands suggested by the score card. The total situation can be presented in a different form in Table III.

You will find an interesting analysis of the situation in St. Paul. I think copies of this table have been distributed; it begins Lafayette, Jefferson, Monroe. The names of those buildings are about the only thing in their favor out of a total of one thousand points. One may ask, it seems to me, with entire legitimacy, What is the worst building in the town? If there is more than one, that is a question of supply and new facilities.

You can carry a certain kind of conviction out of an analysis of the situation.

You may reach the conclusion, possibly, which I have reached after using the score card on some one hundred and fifty buildings—that a building which ranges above 700 points is a pretty fair sort of a place in which to conduct a school; that a building that ranges between 600 and 700 points is a kind of a building which can, with a fairly small expense, be put into the proper running condition; that a building between 500 and 600 points is a building on which you will have to spend a great deal of money if you are going to make it habitable; and that a building that scores less than 500 points is a building upon which you are going to waste money if you try to put it in the proper condition. You had better abandon it.

We have, therefore, recommended for the city of St. Paul, in the survey which was completed day before yesterday, that the first 9 buildings appearing here on this list be scrapped. The buildings are dangerous; the buildings are unsanitary; the buildings are improperly equipped; the buildings are not lighted; the buildings have nothing in them that is fit for the conduct of a school.

I cannot tell you whether we have made our case or not until the bond election in June, but I think we have presented more evidence than we could have presented if we had just gone in, taken a picture and said, "This is a very ugly building; we don't like it. It is not a fit place for children to go to school."

You carry a certain conviction, then, it seems to me, thru the presentation of your case, in detail thru the analysis of the total situation, thru the suggestion of what is standard.

Standardizing the School Plant

G. D. STRAYER

IN the scoring of school buildings or in the attempt to standardize the school plant we have discovered that it is not possible to think of school buildings as of one type. If we have to consider what is to go into the school building, we have to consider the kind of a school that is to be organized there. We must raise the question in an intermediate school, for example, of the shops that are to be placed there, of the sort of a course of study which is to be established for girls and for boys in that school.

I have become somewhat interested in the question of equipment. One might say the minimum of equipment which ought to be provided in an elementary school, because I find here too that, while all of us will agree without very much discussion that everything which I have listed on these two sheets ought to be found, and while most of you will possibly be fortunate enough to have a very great deal more than is here found, it is interesting to check with some such list, and I have just made this beginning. I would be very glad indeed if you will tell me that this listing of equipment is so inadequate that you would be entirely unwilling to accept a school building provided with the materials here found, so that I would know that they need to be greatly enlarged. You notice we list maps, globes, charts, and so on, bookcases built in, a teacher's closet, and the like.

It is strange when one goes into an elementary schoolroom and discovers that the only place where a teacher may have books which children ought to be using is the window sill, where they are in the way when the window is opened and where they are not easily available. Some day it may be suggested that it is just as important to provide a place in which a single classroom can have in succession a series of one hundred books, as it is to provide seats at which children are to work.

One of the good things about St. Paul that I have not told you about—I have told you all of the other kinds of things—is that the public library, under the same administration as the schools, is sending out constantly to every school building classroom libraries. Some of you know of the work that is done in Kansas City. I hope all of you know of the work that is done in that field at Newark, N. J. There is need not only for books but for the equipment or place in which they are to be put. A classroom often is a very barren place; there is nothing there except the blackboard and the desks. There ought to be a place in which attractive displays can be made, and that ought to be a part of every classroom equipment.

I want to call your attention, under libraries particularly, to material which is available especially for children beyond the fourth grade —government and state bulletins. If I really wanted to make an investigation I should like to know in how many schools here represented this afternoon all of this material that is available is now where children can get at it and is being used: government and state bulletins, collections from the Bureau of Agriculture, Weather Bureau, Childrens' Bureau, Geological Survey, statistical abstract of the census.

I was talking to a very intelligent teacher who is very much interested in a problem which she says is the problem of her teachers' organization. She said she wanted to know why it was that school officials spent more, or less, money in her city than some place else for certain items of the budget. She said, "Where could I find anything like that?" She did not know that there was issued from the census office this fiscal statement from cities, which would have enabled her to tell just how much her city was spending and what proportion that amount was to the total city budget or school budget.

I think children ought to be interested in this sort of thing. Often the very important bulletins with respect to health, agriculture, education, and the rest, are more important than some of the statements, which are entirely untrue, found in the geography printed and edited ten years ago.

I have heard Dr. Judd say on many occasions that children in the upper grades are particularly interested in the real things that are being done in the world and not simply in literature. Here is an opportunity and this is the sort of provision which ought to be made.

Possibly you are not interested in music or pictures or industrial exhibits, but I wonder whether it would not enlighten a great many children if we took the industrial exhibit, in which there is a wealth of that material which ought to be provided, which ought to be taken care of, and which ought to be made available. Have you ever followed thru the work of the museum in St. Louis and found out how easy it is for a teacher who wants to present a particular topic in geography or history, or to offer a field in literature, to go to the museum and get from it all of the materials that are necessary to make the situation at least objective to children? They can see the objects about which she is talking; they can have some realization of what it is.

I do not know why one should separate the primary department from other departments, except that we cannot use many books there. We cannot deal so largely in abstractions. We must have more materials: the sand table, the paper, crayola, water colors, and so forth, thru the list. I do not know whether you would be satisfied with that or not, but it suggests the sort of things which ought to be provided and which ought to be considered standard equipment.

I really do want to say something about household arts and manual training. I think there has been a tendency in a great many communities to say, "We can have no work in the household arts and no work in manual training unless we can elaborately equip a shop or a place in which this work is to be done."

I am becoming convinced that in almost every school building of four rooms or more there is space now going to waste, often in the basement, sometimes in the attic, depending upon the particular year in which the building was built, in which could be installed what one might call a general room for boys, or a general room for girls. In this room might be taught something possibly even a little more important than the kind of thing which is sometimes provided in the name of domestic science or manual training.

I know of a very new school building in which, instead of the elaborate equipment in manual training and domestic science which is ordinarily supposed to be required if you are to do anything, the authorities have equipped four rooms which are general rooms. You have suggested here something for the unfortunate building—the place where you cannot have a great manual training or cooking center—some of the things which might be put in in order to enlarge the opportunity for boys and girls, and possibly give those things which are most essential.

The stove can be an oil stove with an oven to be put on top of it. The building does not have to be piped with gas in order to begin work. A kitchen stove possibly is better than the gas stove; possibly that is the only kind of a stove any of these girls are going to use when they go home; possibly they will learn more about the thing they are going to do if you have a kitchen stove than they would if you had an elaborate gas stove.

I am not satisfied with any elementary school building that does not make some provision for lunch. Even if it be true that children never have to walk more than half a mile, there are days, there are times, when some children ought to be provided for, and it is a relatively simple thing in a very small space, and with no elaborate equipment to make some such provision.

I think I would be willing to say that most of you in your childhood, with an equipment somewhat less elaborate than that suggested here, did a kind of work which was more important than the making of models, which are sometimes to be found in the schools where the more elaborate equipment is placed. Agriculture appears at the end of the list only because there are schools in which so large a group of children are concerned with agriculture that it ought to appear quite as important as any work of the ordinary sort in cooking or manual training. It ought to be provided; it ought to be a part of the regular equipment.

I am not satisfied at all with this; it is merely a beginning; I believe we need to go into the question of the standardization of the school plant from the standpoint of everything that goes to make a satisfactory educational situation.

Now, possibly I might best spend the time that is left in telling you, or possibly letting you ask questions about, how one can best solve a local situation, and what is involved in the way of inquiring beyond the mere scoring or rating of the building.

I hold here a report which tells of the sort of data which we felt were essential in the town of Framingham, Mass. We felt first of all that it was necessary to discover what was the probable need for school accommodations in that community. I do not think that I dwelt upon that at all this morning. I believe that in every community an intelligent superintendent of schools ought to look ahead and ought not to be thinking simply of how he can take care of his present situation.

I think we have tended, in a great many cases, to bungle our building program because we had no program. We were simply trying to catch up instead of trying to plan ahead. I think the statistics of population are quite as important as the statistics which have to do with the present school attendence. Population back over a period of years should be considered so that one may at least make an estimate of what may reasonably be expected fifteen years ahead.

Officials of every business concern I have consulted with respect to the increase of population have reported that they constantly estimate for at least fifteen years. They check up against a decade the past three or four years in order to see whether the previous decade is a satisfactory index of what is happening now. I think we ought to do nothing less than that in our work in school building or construction.

One of the most interesting things that I have found is a sample distribution of employment certificates in every place in which there is a law for compulsory education. It seems to me that persons responsible for the erection of a school building ought to take account of what boys and girls do when they leave school. It seems rather an obvious sort of thing, and I know someone is going to object immediately, for the employment certificate does not tell the whole story, because the boys and girls go into an employment and then they move. But it does tell this story: it tells what is the demand in the community for employment, and even tho it be true that they move from one place to another within this whole region, it is nevertheless true that this is a measure of how much the industries are demanding; how many persons they have to have; and there is a question, then, of the relationship of the school to the preparation which is needed.

I am always interested in the fact that in a community of any considerable size one of the biggest opportunities that there is for girls is in the field of salesmanship. It is one of the fields that we have almost wholly neglected outside of Boston and two or three other centers in the United States. We try apparently to make stenographers out of everyone even tho we know that the market is particularly glutted and that there is very little opportunity in that field except for those who are exceptionally well trained.

We found it of use to raise the question, possibly one of the most interesting from my point of view that we did raise, of what the occupations of all of the adults in the community were, in so far as we could get them. You can get them sometimes, of course, in a certain sort of analysis from the census. You can get them in some communities in rather a remarkable way from a directory.

I wonder if you ever stopped to make the directory analysis or possibly, as Dean Smith did here in Bloomington at one time, a house-to-house canvass of what was going on, what people were doing, what their employments were. We found in one of our inquiries at Framingham, Mass., a person who was named as a Mayflower conserver. Now, we were very much interested in the Mayflower conserver; we thought that would fall outside of any of the occupations we had ordinarily found. On looking it up, however, we discovered that the conserver conserved peaches and pears and other things like that, and the brand was the Mayflower!

It is interesting, if you want to see how the school, as at present organized, checks up against your employment certificates, checks up against your occupations of people in the community, to ask this question concerning student hours by subjects, How is the curriculum of the school at present organized? You will run across something as astonishing, possibly, as this: in a particular high school, English gets 1,728 student hours; history, 907; typewriting, 670. Elementary science, which is really a general science course, gets 660; German, 630; physical training, 588; Latin, 505; algebra, 387; and pretty soon you will discover, if you go down thru the list, that while most of the children leave school before the end of the second year, everything in it that has any very great weight or importance according to student hours, aside from typewriting and shorthand, leads directly to college. If you check student hours against the working papers that are issued to those same children when they leave school, you will find in a great many cases a most remarkable discrepancy between the kind of education which is being offered and the suggestion as to what people are going to do after they leave school.

I should be very glad if there are any questions; there are three minutes left for questions concerning the use of the score card, or relationship of scoring to the development of a school building plan. If not, I think I shall rest my case there.

Significance and Present Status of the Survey Movement

G. D. STRAYER

I HAD an experience recently which led me to believe that there are many people who do not understand the significance of the school survey, nor the methods which have been employed in those already conducted. I went into the office of a certain superintendent of schools where I met with him the chief officer of the board of education, and I was asked whether or not it would be possible to undertake a survey for the purpose of rating individual teachers in order that the responsibility of the local administration for the dismissal of teachers might be taken care of by the school survey.

I cite that as an example of a type of expectation with respect to the school survey, rather than as the sort of thing that might commonly be expected to result. The point I would make is that this particular administrative officer and this particular president of the board of education thought of a school survey as a means of relieving themselves of responsibility for the successful administration of their schools.

I am reminded as well that early in the development of the school survey movement it was suggested at times that school surveys were undertaken with the idea of removing someone from office. It was suggested in one of the early, and possibly one of the most important of the school surveys, by a certain man who wanted the survey brought about, that if the survey were only undertaken, it would be possible to remove from office the superintendent and that possibly even members of the board of education might see fit to resign.

That conception of a school survey seems to me to be as far from the truth with respect to the purpose and significance of the movement as it would be to suggest that a doctor be called into consultation with another doctor in order that he, the second doctor, might kill the patient, or that an engineer be called into consultation with another engineer in order that disaster might result, for I can see no possible reason for the consultation which is undertaken in the name of a school survey, except that which promises a constructive program for the development of the particular school system which is under investigation.

For that reason it seems to me that school surveys have been most successful and most significant in the program which they have proposed, rather than in the fault which they have found or the weaknesses which they have pointed out. The method of the survey to date has been largely the method of becoming acquainted with the facts, measuring somewhat more accurately than has been done hitherto by the ordinary administration in the field that we ordinarily designate as administration. For example: the school survey has sought to reveal to those charged with administrative responsibility and to the community itself at times what is good administration.

I think, for example, of a situation in which there is a very large board of education, an unwieldly body, a group, who, in the words of one very eminent surveyor, indulge themselves in such tactics that whenever the surveyor had a friend visiting in that city and wanted to show his guest a good time he took him to a board of education meeting. The survey has been critical with respect to the administration itself, not in condemning it in its actions, but in inquiring concerning the possibility of efficiency with the type of organization at present employed.

In another community in which I have been interested, the question raised by the survey was the question of a many-headed school system. The question concerned a school system in which there were at least five separate and distinct heads. The survey sought to inquire whether or not in business enterprises, or in social enterprises in which men are engaged, it is possible or thought probable that efficiency can result from the type of organization there found. Then there has been raised constantly the problem of organization. It seems strange, when we stop to think about it, that if we go back fifteen years, no, if we go back ten years there were very few facts available in the ordinary office of the superintendent of schools or in the office of the state school system. There were very few facts upon which to base any program for the organization of a school system.

The school systems had been organized upon a theory, which originally was that if you assembled the children of a little neighborhood in a classroom and gave them a teacher you had a very good school. The reform which followed assumed that if you assembled children in the same school building and divided them up into groups you could pass them along year by year thru the school system.

Anyone who has stopped to inquire concerning the facts has met with the suggestion that possibly the first type of organization with all of its flexibility had something in it that was worth while, and that the later type of organization, which had in it all of the promise of having children exactly alike, fell short of accomplishing the result that it started out to get. For if the survey and the idea of the survey in measurement has meant anything in the field of organization, it has meant the discovery of the fact that everywhere boys and girls are being assembled in groups which are not homogeneous, but in which the children vary so tremendously in ability and in which the demand is so far beyond the possibility of accomplishment and so little compared with the possible accomplishment of others, that the system is rather awkward and needs to be reformed.

Some have been brave enough to suggest, after the measurement has been undertaken, that the reform is to consist of assembling children more frequently according to their varying capacities than we have done hitherto. It is suggested, and it seems to me wisely, that the type of experiment which has been undertaken in a few of our American cities, the experiment which suggests that at least bright children are worth taking care of, be made a common practice. It is interesting, as a result of measurement, to reach the conclusion that the most retarded school children in the United States are the bright children. The result of every measurement that has been made in every field in which it has been undertaken establishes this fact. I say this in the light of that type of inquiry, that sort of measurement in which we attack the problem of organization.

The whole meaning, it seems to me, of the intermediate school could never have been clear had it not been for the fact that before we talked very much about surveys, Florence Kelley went into the state of Massachusetts, out into the homes of the boys and girls in that state, and said to them and to their parents, "Why did you quit going to school?" The discovery which followed was that 70 per cent of all of the parents of all of those boys and girls said, "They quit school because the school had in it nothing which was worth while for them."

The discovery by the man who made the careful investigation with respect to the continuance in high schools in New York City is significant; that discovery that a mere judgment that it was necessary to have a high school course in order to engage in the particular occupation which the boy or girl expected to enter multiplied the possibility of continuing thru the high school course. That bit of measurement suggested the possible reorganization of schools according to the variety of occupations or vocations into which boys and girls go rather than the former organization based on the prior assumption that all that was necessary was an opportunity to go to school.

But to go beyond the field of administration as such, and the field of organization, we have discovered a most interesting situation with respect to the cost of education. Again possibly you feel it is an administrative problem. It is. We had assumed apparently, in a great many communities, that all that was necessary was to build our buildings, staff them with teachers, properly heat and and ventilate them, and we have assumed that everyone was honest. I doubt whether there is any group of persons more honest than the persons who manage our schools, but we suddenly discovered, the minute we began to measure, that it cost tremendously more to educate boys and girls in one sort of a building than in another. It was discovered that in one building, a small building, it was costing $5 more per pupil than it did in a relatively large building. It was discovered in another community that the coal necessary to heat the buildings which housed 25,000 children had been saved by installing a scheme of weighing coal in the buildings. A very prosaic sort of educational inquiry, but the kind which relieved for other uses money which had not been stolen, but which had been poorly administered.

I believe that there has been a real advance made possible for public education thru the introduction of a scheme of cost accounting, and the survey has taken it upon itself over and over again to suggest that there can be no such thing as an adequate administration of a school system any more than there can be an administration of any other enterprise without the introduction of a school of measurement, which, if you please, calls for the accounting of the money spent.

I have been interested and I have suggested from the platform today that we ought to be more intelligent with respect to the building which we construct, and the use that we make of it. To some few of you I suggested the necessity for more careful measurement there than we had commonly indulged in. I see no reason why we should not expect that in every school building under intelligent management the psychometer, introduced to determine the degree of humidity, would be just as common as a foot-rule to determine the cubical contents of the room. I see no reason why we should not be just as certain about the amount of light furnished to every desk in the room and make our illuminometer or photometer measurements to prove our case. I see no reason why we should not do that just as we have indulged in other more common measurements.

One is astonished, when he becomes enthusiastic about the progress that has been made in the administration of public education in the United States, to discover that we have yet barely scratched the surface with respect to the enforcement of our compulsory education laws. In every city in which a careful examination of the field has been made and careful measurements have been instituted, it has been discovered that boys and girls are, some of them, amenable to the compulsory education law by virtue of the fact that at some stage or other in their careers they have been put into school and then have been followed up after that time, and that certain other boys and girls for some reason unaccountable have been left out of the school and have not been followed up.

For example, in New York City, when we instituted a permanent and continuing census, the only satisfactory basis upon which to hope to enforce compulsory education, we discovered 25,000 children who were not known to exist prior to the establishment of that rather simple educational measurement. There is only one city in the United States with which I am familiar in which there has been absolute proof that all of the children have been followed up and kept in school, and in that particular city, I hestitate to mention it here tonight, it was discovered at one stage of their type of measurement that they had 110 per cent of all of the children of the city in school! In a field so simple as that one, a field which is fundamental to the whole educational program, the survey has had to point out over and over again that only as we know where children are, only as we have a measurement which enables us to check up all of the time and tell where persons are all of the time, can we reasonably expect to get them into school.

We have also discovered that it is not enough merely to establish machinery for the purpose of keeping children in school. A measurement we instituted has discovered to us that it is possible in some cities for children to stay out of school two or three weeks before the machinery which is established gets to them and gets them back into the school. That is, we teach them to be truants, we establish the habit of truancy, because we almost give them notice that if they will just break loose we will not trouble them until they have been out two or three weeks.

We have heard much, and there is much still to be said, about the measurement of the achievements of children. It was a great step forward when we began to measure the achievements of boys and girls in such a way as to make possible the comparison among classes, among schools in the same school system, among the school systems all over the country. It is a great contribution which is presented, when you can see on the chart, as you did this afternoon, the difference between the type of teaching of reading which gets a certain result in Cleveland and another sort of teaching of reading which gets a very different result in St. Louis.

It was necessary in the survey movement that we emphasize first of all this measurement idea, this idea of checking up, of comparing, of discovering how one situation compared with another. Out of that situation there is coming, it seems to me, and coming in considerable measure by virtue of the survey, that kind of inquiry which asks why we get this particular result, how we get a different result, and indeed in the development of tests or schemes of measurement there is coming, most certainly it seems to me, the idea of the test or measurement as a means of prognosis and not simply as a measure of something accomplished.

At the time that this conference was suggested I had hoped that some of you would become interested in certain tests in arithmetic which I hope if you have not yet tried you will some day. I refer to Dr. Woody's tests which permit of an analysis of the difficulties which children encounter in their work in the fundamental processes.

Our first measurement in arithmetic had to be a measurement of how much children could do of a particular sort of arithmetic. This second stage in the development of the tool which we use, the test which we have, is that stage in which there is prepared a measuring-stick which will enable us to tell just how far the pupil can go from an accomplishment which approaches zero to an accomplishment which approaches that limit which will prove entirely satisfactory in terms of ability to do work in the fundamental operations. I am inclined to think that in all of our work in the field of measurement we are moving rapidly in the direction of using the measuring-stick very much as the doctor uses his instruments. He takes the pulse, he gets the temperature, he finds out the rate of breathing, he makes his blood count, and then he can act intelligently in the experiment which he is to undertake, for if he is a thoroly good, well-trained physician he knows his business first and then he experiments with us. So it seems to me that in this field of education, largely as a result of the survey, we are going to measure the results that we are getting, we are going to measure in order that out of the measurements we may diagnose the case and be able to propose the experiment which will bring us results.

It is interesting that in this whole survey movement the thing that has possibly been least well done (I am not unmindful of the attempts that have been made in many of the surveys) is the discussions of the relationship of our schools to the community in terms of the curricula which we have placed in them. I think probably the reason for that lack of contribution—if it is a lack—is due to the fact that a long period of time is involved, that a most careful psychological and sociological analysis must be instituted. Then it is necessary to examine with very great care the society in which we live before proposing the curriculum which ought to prove satisfactory. Yet in this field possibly the big contributions in the field of those surveys which we have called vocational educational surveys promise much for the future of the whole system, for it is true that in the vocational surveys we have discovered at times that the proposition made with respect to this special type of education, this highly technical sort of training, has been without any very great appreciation of the sort of skill demanded or of the time taken to learn to work in the particular vocation.

If I were then to try to summarize the situation of the survey movement in the United States and to think it over with you in terms of its significance, I would suggest first that the survey movement grew out of that movement which has spread thruout our society, that movement for efficiency which has led us to experiment in practically every field. We have tried those various systems or schemes of government, the commission or the management type. We have had the efficiency engineer going out into the business to reorganize it. We have had a tendency possibly to place too great stress upon the idea of efficiency, but out of that situation there developed first of all, if I analyze this situation correctly, the idea of investigation, the idea of determining where weaknesses were to be found, in order that the situation might be strengthened. More recently there has come a type which seems to be more worth while—the type of survey which is demanded for the presentation of a program for development.

I would like if I could to have that idea dominate all future surveys, the idea, not necessarily of pointing out the weakness in order that it might be remedied, which is simply a measure taken to relieve distress, but rather the idea of a study of the whole situation in its strength, as well as in its weakness, in order that a program for future development may be instituted.

There are, it seems to me, when one stops to consider the significance of the survey, certain very definite limitations to the application of the method which has been suggested today and applied. The survey must, by virtue of the fact that it is, as I have described it up to this moment at least, conducted by an outside agency, be limited in the possibility of following up, continuing its inquiry, checking up the value of the suggestion or recommendation which is made. It seems to me, therefore, that out of the survey movement, if it is to be most significant, there ought to be developed the idea of following the result of the survey or its recommendations on thru the next year and the period of years which is to follow in order to discover whether or not the method employed, the recommendation made, was sound, all of which seems to me in the last analysis to mean this: The survey has been instituted by virtue of the fact that we are becoming or seeking to become more scientific in the attack upon our educational problems, and that as the survey shows the way, as I think it must in many cases, so there must be following the survey work of the man, the work of the woman, who continues that problem and who follows it up over a period of years to the realization of the success which the survey promises.

I think that out of the survey movement there is to be developed the scientific attitude toward the problem of administration, and, as that develops, I believe that out of the survey movement, in so far as it is scientific, there may be expected to develop the profession of educational supervision and administration.

Practical Improvement in General School Administration, Resulting from the School Survey

G. D. STRAYER

THE topic announced is "Practical Improvement in General School Administration, Resulting from the School Survey". I think I would be willing to state that every improvement that has ever been made in school administration has grown out of a school survey, and then I would hasten to define a school survey, because everyone who is at work upon the problems of educational administration is constantly surveying his field. He is constantly inquiring concerning it, and, in proportion as he brings to the solution of his problem all of the facts that there are available, in proportion as he has surveyed the situation before he attempts to do his tasks, it seems to me you may expect improvement.

I am going to confine myself, if I may, to the actual improvements which have been made as the result of the particular type of survey which is popularly called by that name, because the survey as instituted, whether in the state or in the county or the city, is, in effect, simply an extension of the regular administrative activity. It is simply the calling in of some one to supplement the work of those regularly charged with the administration of schools, and I want to start with the state problem because I understand that you are interested in the state problem in Indiana.

What has resulted from state surveys? Not all that we can possibly hope and yet there are some things which stand out rather distinctly. For example, it has been discovered in one state survey that the most certainly political type of board that you can get is a bipartisan board of education. The minute you say that this board of education in this state is to be a board composed of seven persons, four of whom are to be Democrats and three of whom are to be Republicans, there is no one who can take a seat upon that board except a man who has stood out as a ward heeler, or a political leader in some part of his state. I say the most awful mistake that could be made in a constitutional convention would be to propose for the state of Indiana a state bipartisan board of education.

I think it has been discovered as well that on the whole it is not advantageous to place upon a state board of education men who take their place upon that board by virtue of their excellence, their learning, their skill in the field of education, and now I know that some of you will resent what I have to say. The reason is this: If the survey shows, as it has, that the only adequate type of state administration is composed on the one hand of laymen who are charged with the responsibility of representing the public, and on the other hand of executives who are specialists in the field of education, then the distinction on the whole had better be kept. That is, the board had better be thought of as a lay board of education, a group of men who represent their state, the finest, the best men that the state has.

It may chance that an educator, a superintendent of schools, the president of a state institution may occupy a post upon that board, but to make it an *ex-officio* board, composed of persons who occupy educational posts of importance, is to suggest that the executive officers employed by that board are not of the caliber that you ought to have to administer the schools of the state.

If the survey has given us any basis upon which to plan for the future it has suggested the lay board of education. I think you might go ahead in the other way. You have been unfortunate in a sense and sometimes fortunate in the way you have administered public education. The chances I should say are in favor of the situation I have attempted very briefly to describe.

It is possible to elect a first-class man for the office of state superintendent of schools. It is not probable that over any long period of years as able men can be had for the office of state superintendent by election as can be had when the selection of a state superintendent of schools is left in the hands of a lay board with freedom to go wherever they wish to find the best people available for their executive staff. Other things have happened as a result of state surveys in the general field. There has been established, for example, as the result of one state survey, an idea of supervision, which I think is essentially sound, and in another state a poor plan was recommended.

I hesitate to report upon the plan of supervision which I think is essentially unsound. I think I ought possibly to be fair and tell of both. In the case in which the state survey pointed the way to adequate supervision, it suggested that the natural unit of supervision was the county, and that is, I am sure, sound. The further suggestion was made that, in the development of this county supervision of schools, it was necessary not simply to multiply the number of supervisors charged with general supervision or responsibility, but that it was advisable to pick persons who could attack particular problems. Provision was made for those who would attack the problem of supervision for the primary school, for others who would attack the problems of supervision for the upper grades, someone who could be charged with responsibility for looking after one-room rural schools, and someone who could attack the problem of the high school organization.

The survey which made a mistake that they will not get over for years and years is the survey which suggested that the way to establish county supervision is to take your county, break it up into three and four and six units, and then put over it a supervisor who knows nothing about primary work, nothing about the upper grade work, nothing about high school work, but is just a general sort of a person who knows it all. Those two surveys stand out in my mind as distinct. The one recognizes out of all of the practice that we have had that we must specialize in supervision as we specialize in teaching. The one survey says you cannot hope to organize adequate supervision, unless you make the unit big enough to bring into your supervisory corps persons who know particular parts of the school system so well that they can do adequate supervision in that field.

The state survey has been interested in one case at least in the establishment of an adequate scheme or plan for the collection and use of statistics. I hasten to say the *use* of statistics because all over this country today state officers of education and even sometimes local school administrative officers are engaged in collecting statistics, in order that they may fill the files in their office, but that is all that ever happens to them.

I know of one case in which over a long period of years there had been collected or kept an individual record card for every pupil who went thru the elementary school. In that particular system of schools when the cards for all of the children coming up to a certain high school were presented to the principal of the school he said, "Here, John, take them down to the furnace." That is all that ever happened to those cards; they made fuel, there was a certain amount of steam generated, I judge from the cards.

Some of the teachers in that school system would have spoken had they had a chance—of the steam that had been necessary to fill them out, but I say that there have been enlightened people who have said at least in one of the surveys, "What are these statistics for? What are we to hope to get out of them? Let us confine ourselves to those statistics which are meaningful, those which are to make a difference in the way we handle our school problem."

I know of one case, for example, in which the state department seeks thru its collection of statistics actually to keep track of what is going on in the local school systems. It actually employs intelligent persons and sends out intelligent suggestions by virtue of the work that they are doing in their statistical division. Of course, such a statistical division will probably never be organized, except under the sort of state administration which is suggested by the lay board and the professional staff chosen by virtue of their particular training. In another state in which the survey has been conducted, two thoroly capable men have been appointed for statistical work. These men have gone to work, as some of you may know, to educate the teachers of that state in the use of statistics. Recently a conference was held in which these men taught superintendents of schools, normal school teachers, and others how they might to best advantage collect statistics, make measurements, and utilize them in the actual work of administering the schools.

In another state in which a survey was undertaken there was established, as a result of the survey, the intermediate school. I don't need to discuss that here, because I am sure you are all quite as familiar with the idea as I am. But in that state boys and girls had little opportunity, except as they went to the high school out of the regularly established, absolutely uniform, eighth grade elementary school system. In that state as a result of the survey they have attacked the problem of giving a fair chance to boys and girls, even the sort who do not go on thru the traditional high school course. Plans are under way for a differentiated course of study, and they are at the present time establishing such schools.

It has been common in the state surveys to discuss the problem of the training of teachers. Some of the recommendations it seems to me have been valuable. I am persuaded, for example, that the recommendation suggesting that we do not need and should not have a uniform training for all teachers in the first eight years of the school system is essentially sound. We ought to have rather the training for those who are to work possibly in the primary grades, the intermediate grades, the junior high school, and the other part or division of that school. I am interested as well in problems which I understand you are to attack here, the problem of the county as the unit or possible unit of supervision and administration.

There have been made some four or five county surveys which have attacked this particular problem. If it be true that the state needs to develop a strong administrative board who choose the professional staff, how much more certainly true it is that we can never hope to have a local administration until we establish the county board of education and the county superintendent and staff chosen by virtue of their fitness for the position and with relatively secure tenure by virtue of the fact that they do not have to appeal to anyone other than that small group to whom they report and who know and understand the difficulties of the work which they are undertaking.

In a recent survey, for example, it was discovered that all of the suggestions or promise of democracy with respect to the equality of opportunity which we are to provide, and the equality of burden which we are to share, disappeared when we looked into the county and asked ourselves the question, "What do people pay and what do they get?" One community was paying ten times as much in taxes on their $100 of wealth as another community in the same county. You did not have to go out in a poor part of the state to find this condition, but right in the same county one community was paying a tax ten times greater than another, and all of the gradations between. But possibly that was not as interesting, it did not seem to me so, as this other fact, that under this system of local administration high schools and high school courses of study were extremely variable. The first inquiry that we made was, How much do teachers get? There are most excellent teachers working for $600 a year, but the more excellent they are the less likely they are to continue to work for $600 a year. We discovered that in the smaller high schools the teachers were at a minimum in salary. They were the kind who did not make good, they were the sort that were left over after the bigger and more important centers had taken the high school teachers that were really successful. Then we made another check. We asked what happened to one of these children when they go up against the state examination.

In New York state, as you may know, high school teachers are parties to the making up of the high school question papers. This is not an examination which is handed down from the central office, but it is made up by teachers and principals of schools from all over the state. It was discovered that there was a variation of 20 per cent in the number or proportion of those passing those examinations between the large high schools on the one hand and the very small high schools on the other. Does that tell anything? Does that survey prove anything? It seems to me it does. It is uneconomical; costs run very high when you try to run a very small high school. Costs are reduced, teachers' salaries are increased, the quality of the instruction given is improved, as you concentrate your high school, make it larger, and give it greater variety of opportunity.

I doubt very much whether any discussion or consideration of the problems facing you in Indiana can even be thought to have attacked the problem of reforming education unless, you, every one of you, stand for the idea of the county as the unit of organization. I think we have the proof, I think that all that you need to do is to put the steam back of it to make it carry conviction all over this state. I know ot the difficulties that you are going to have in this particular county of which I have been speaking; there has now been organized an association of all of the more intelligent persons of the county and they are appealing to the legislature to grant them permission to reorganize. And there are in that state, as there will be in this state, a group of the other sort, who say you are going to take our schools away from us, you are going to be undemocratic, you are not going to allow us to have as bad schools as we would like to have. I think that is about the answer.

I have been interested also in the city surveys. Altho I have touched very briefly the idea of the state survey and the idea of the county survey, I have been interested as well in the results which have come from the city survey, and there I am inclined to think possibly one of the big contributions again has been the establishment of the idea that a board of education has certain functions and that a superintendent of schools and staff have other functions.

I remember in one place in which a survey was conducted, the president of a very large branch of the American Telephone and Telegraph Company became president of the board of education. He has said, and he has represented the situation graphically, that a board of education has no more right to attempt to control education in their community thru any action which they are to take with respect to supervision, any action which they may take as to the placing of teachers, any action which they may take as to the selection of books; that they have no more right to do that than the director of a corporation would have to go into the office of the president and say, "Here, I don't like John Smith; get rid of him. This material that you are using doesn't please me, I have a friend who sells something different and I should like to have you put that into this business."

He says no man in a business enterprise ever dreams of doing anything like that. The board of directors in every business concern that I know anything about are constantly holding their executive officers for results and I am not willing to think of a superintendent of schools in any different terms than those of which I think of the man who is charged with executive responsibility elsewhere. Superintendents of schools, wherever they are, must produce results and they must give evidence of it.

I remember another superintendent of schools who had around his office charts showing the achievements of pupils. He had a board of education which in his community was called the "millionaire board of education". The members usually went to the board meeting and had the superintendent tell them what to do, did it, and went home. They usually got thru in about fifteen or twenty minutes. They got a new superintendent of schools, who began to show them what was going on in the school system. He began to show them the progress that was being made, he began to suggest the possibilities of economies. He began to suggest a program for development which would require money, which program he illustrated by graphs, and they stayed until one o'clock in the morning. He got to the point where he was using the language which they understood, and he was carrying conviction by virtue of the fact that he did not say, This is what I hope, this is what I believe, this is what I have faith in; he said, This is what I have done and this is what I hope to do by virtue of the evidence that I already have assembled here of things accomplished.

I believe that out of the survey movement, out of this insistence upon measurement, out of this attempt to find out where we are, there is developing a better sort of relationship between the board of education and the superintendent of schools, that is, the superintendent of schools who knows how to handle the professional problem—the superintendent of schools who is an expert in his field.

Do you know I hesitate to suggest it, but all of the other professional persons with whom you are acquainted are constantly being respected by virtue of the fact that they know something more than the other fellow does and that they can tell you things that you cannot possibly find out for yourself. So long as a superintendent of schools anywhere talks simply in terms of what he would like to do, what he believes in, what he hopes for, everyone else in the same community has exactly the same right and possibly may have just as good a judgment, and it is only when he becomes technical, if you please, only when he can establish his case in such a way as to make it clear, that he has available knowledge which the other fellow does not have. It is only then that he can expect to have such a relationship between himself and board that promises for the development of the school system.

I have been interested, of course, in the results which have come from the school surveys in terms of a reorganization of the system of city schools. During the past ten years every superintendent of schools worthy of the name has printed in his report an age grade table, and many of them have then gone off and forgotten it. If there is anything that ever cried to heaven for relief it is every age grade table that has ever been printed in the United States.

Don't you see there is something more than just a little bit of technique in being able to make a few statistics in order to print them in the report? The survey has suggested in every age grade table that has been printed that it is the basis upon which reorganization must take place. If you try to come back at me, and really you ought to have a chance to come back at me rather than to allow me to talk this way, I say if you had a chance and you came back and said Yes, but my system is a small school system, I would say that that was no excuse, because there are men who have discovered that even in the small school systems it is possible at least to provide for the extreme cases, at least to provide one class, if not more than one, in which those who need special attention can be placed. Moreover, the thing that I have not been quite able to understand, is that after practically every survey that has been published has suggested the necessity for the reorganization of the last six school years, the man in the small school system has still said to me over and over again, Yes, but it doesn't apply to me. Some of you know why you are the men above all others who have something to gain by this type of reorganization. In your seventh and eighth grades you have as many teachers now as you have in your high school. Just think of the tremendous advantage you would get if you took your seventh and eighth grades, made them a part of your other organization—that is, made a six-year organization. Just think how by doubling the number of teachers that you have available for that six-year course you could differentiate your courses; how you could make provision that you now cannot make because you are running these independent organizations.

Consider this group of seventh grade teachers who are trying to cover everything and cannot possibly do it—I would not try to qualify as a seventh grade teacher. I do not see how any one can. I think he ought to have been about ten years in his preparation to be a good seventh grade teacher, but under the new type of organization, where the six-year school is established, it is possible for these teachers to specialize or for you to find the teacher who can specialize in history, geography, and so on. The thing that we never teach, or almost never teach well, can be specialized in, as the teaching of mathematics; we can specialize in the manual work or the household arts.

No, if you are in a small school system the survey points the way to a reorganization which means a much greater opportunity for the boys and girls in your community. Surveys have discovered a good many other interesting things. I am not able to talk about all of them. One of the things tho I have always been interested in is the question, How can we promote children or what kind of a marking system should we have?

The surveys have concerned themselves with those things. It has been discovered that, if you are fortunate enough in a crowded section of a particular system that I have in mind, you will pass thru that school system in a great hurry. They have to have the seats. If you live in another section of the same city (I can give it to you statistically) where the population is diminishing you go very slowly. In terms of per cent, if you happen to live near one school building, your chances are 8 to 10 of finishing the eight years of the elementary school course in less than eight years. If you live in the other community your chances are 1 to 30 of getting thru that elementary school in less than eight years and you do not have to speak a different language, wear different clothes, you do not have to be intellectual; it is just a matter of organization.

It has been discovered that if you are unfortunate enough as a high school pupil to go to school to one teacher in a German department, you have 1 chance out of 3 of being failed at the end of the first half-year that you undertake the work in German, but if you go to another you cannot fail. If a careful administrator will look into the kind of marks given by teachers he will discover variations from teachers who always pass everybody to the teachers who fail 40 per cent of their classes. If you don't believe it try it in your school and see; I am thinking particularly now of high school courses and classes.

Every one of you who is a supervisor or administrative officer ought to be a school surveyor. If you are not, you are a mighty poor sort of a school administrator or school supervisor.

Appendix

(To accompany paper of Professor G. D. Strayer)

INDIANA UNIVERSITY SCHOOL OF EDUCATION

Bureau of Coöperative Research, Bloomington, Ind.

SCORE CARD FOR SCHOOL BUILDINGS AND EQUIPMENT FOR ELEMENTARY AND HIGH SCHOOLS*

City ....
Principal ....
Enrollment: Boys.......... Girls..........
Average Daily Attendance: Boys... Girls...
Number of Rooms.........................
Scorer ....

Building ....
Date ....
Total ....
Total ....
Approximate Cost.....

INSTRUCTIONS

1. Abbreviation: S—Standard.
2. Basis for scoring—1,000 points.
3. In scoring classrooms, stairways, entrances, fire escapes, and the like, score each separately and insert the average for the final score.
4. It will be worth while to use this card in checking up blueprints of prospective buildings. To do this will require a complete set of specifications with the blueprints, also a copy of state laws and city ordinances.

SHORT FORM OF SCORE CARD

I. SITE .... (125)
  A. Location .... (55)
    1. Accessibility (25)   2. Environment (30)
  B. Drainage .... (30)
    1. Elevation (20)   2. Nature of Soil (10)
  C. Size and Form.............................. (40)
II. BUILDING .... (165)
  A. Location .... (25)
    1. Orientation (15)   2. Position on Site (10)
  B. External Structure .... (60)
    1. Type (5)   2. Material (10)
    3. Height (5)   4. Roof (5)
    5. Entrances (10)   6. Aesthetic Balance (10)
    7. Condition (15)
  C. Internal Structure .... (80)
    1. Stairways (35)   2. Corridors (25)
    3. Basement (15)   4. Attic (5)

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* Reprinted from the *Fifteenth Year Book of the National Society for the Study of Education*, by courtesy of G. D. Strayer, Teachers' College, Columbia University.

III. SERVICE SYSTEMS .... (280)

- *A.* Heating and Ventilation System................ (70)
  1. Kind (20)
  2. Installation (10)
  3. Air Supply (25)
  4. Distribution (15)
- *B.* Fire Protection System........................ (65)
  1. Apparatus (10)
  2. Fireproofness (20)
  3. Escapes (20)
  4. Electric Wiring (5)
  5. Fire Doors (10)
- *C.* Cleaning System .... (20)
- *D.* Artificial Lighting System..................... (20)
- *E.* Electric Service Systems....................... (15)
  1. Clock (5)
  2. Bell (5)
  3. Telephone (5)
- *F.* Water Supply System .... (30)
- *G.* Toilet System .... (50)
  1. Distribution (10)
  2. Fixtures (10)
  3. Adequacy (10)
  4. Seclusion (5)
  5. Sanitation (15)
- *H.* Mechanical Service Systems.................... (10)
  1. Elevators (5)
  2. Book-Lifts (2)
  3. Waste-Chutes (3)

IV. CLASSROOMS .... (290)

- *A.* Location and Connections..................... (35)
- *B.* Construction and Finish....................... (90)
  1. Size (25)
  2. Shape (15)
  3. Floors (10)
  4. Walls (10)
  5. Doors (5)
  6. Closets (5)
  7. Blackboards (10)
  8. Color-Scheme (10)
- *C.* Illumination .... (85)
  1. Glass Area (45)
  2. Windows (30)
  3. Shades (10)
- *D.* Cloakrooms and Wardrobes.................. (25)
- *E.* Equipment .... (55)
  1. Seats and Desks (40)
  2. Teacher's Desk (10)
  3. Bulletin Boards (5)

V. SPECIAL ROOMS .... (140)

- *A.* Large Rooms for General Use................. (65)
  1. Playroom (10)
  2. Auditorium (15)
  3. Study-Hall (5)
  4. Library (10)
  5. Gymnasium (15)
  6. Lunchroom (10)
- *B.* Rooms for School Officials..................... (35)
  1. Offices (10)
  2. Teachers' Room (10)
  3. Nurses' Room (10)
  4. Janitor's Room (5)
- *C.* Other Special-Service Rooms.................. (40)
  1. Laboratories (20)
  2. Lecture-Rooms (10)
  3. Storerooms (5)
  4. Studios (5)

DETAILED SCORE CARD FOR CITY SCHOOL BUILDINGS

I. SITE

A. Location—

1. Accessibility—centrality (present and future), car lines, streets.
2. Environment—
   - (*a*) Physical: gardens, trees, shrubbery, buildings, hills. (S—Skyline should not have an angle of more than 30 degrees from base of building.)
   - (*b*) Social: density of settlement, composition, moral influences.
   - (*c*) Protection: freedom from noise, dust, danger, malodors.

B. Drainage—

1. Elevation, slope. (S—Grounds should slope away from building and should not exceed 1 in. for every 3 ft.)
2. Nature of soil; residual or artificial kind, texture, aeration, hydration, surface material.

C. Size and Form—

Should be large enough and of good shape to allow for proper placing of buildings, for 30 sq. ft. of playground per child, and for school garden.

II. BUILDING

A. Location—

1. Orientation: light, exposure. (S—Southeast, east, southwest, west, and south in order.)
2. Position on site as regards appearance and economy of playgrounds.

B. External Structure—

1. Type: rectangle, square, inner court, T, H, E, U.
2. Material. (S—Brick or stone.)
3. Height: number of stories. (S—Two stories above basement.)
4. Roof: type and material. (S—Flat, waterproof, suitable for playground, proper slope for drainage.)
5. Entrances—
   - (*a*) Number, location, width. (S—At least two, near stair landings, 11-13 ft. wide.)
   - (*b*) Steps: number, protection from the elements. (S—As few as possible, unexposed.)
   - (c) Vestibules: size, lighting. (S—11-13 ft. wide, double-swing glass doors, and waterproof floors.)
   - (*d*) Doors: kind, opening, springs, checks, stops. (S—3½ ft. x 8 ft., opening outward with panic bolts.)
6. Aesthetic balance. (S—Simplicity and utility.)
7. Condition. (S—Should be in good repair.)

C. Internal Structure—

1. Stairways—
   - (*a*) Construction: kind (box, open, winding), material, tread and riser, nosing, width, landing, banister (number, kind, size, stability), soundproofness. (S—Tread, 11-13 in.; riser, 7 in.; width, 5 ft.; metal banister, 1¼ in. dia., at least two for each stairway, firmly attached.)

- (*b*) Number and location: proximity to exits. (S—At least two, landings near exits.)
- (*c*) Lighting: natural and artificial. (S—Should be well lighted.)
- (*d*) Sanitation: coves, corners, ledges. S—Should have sanitary coves and be free from dust-catchers.)

2. Corridors—
   - (*a*) Location.
   - (b) Construction: material, width, door arrangement, finish (chair rail, picture mold, dado). (S—Width 11-13 ft.)
   - (*c*) Obstructions: lockers, cases, pedestals. (S—These should not obstruct easy passage.)
3. Basement—
   - (*a*) Depth below grade, dampness, areas. (S—Depth, 3 ft.; floor and walls waterproof.)
   - (*b*) Boiler-room, accessibility to fuel-room, exits, ash-lifts.
   - (*c*) Fuel-room, size, construction, chute.
4. Attic, waterproof, heatproof, floor.

III. SERVICE SYSTEMS

NOTE.—Defects in any service system should be checked against the system wherever found.

A. Heating and Ventilating System—

1. Kind of system: direct, direct-indirect, gravity, plenum, plenum-exhaust.
2. Installation: piping, workmanship, noise, control. (S—All piping should be insulated.)
3. Air supply: source, amount, humidification, ducts. (S—From the top of the building—humidity 40-60 per cent; 2,000 cu. ft. per hour per pupil, should not enter with a velocity greater than 6 ft. per second.
4. Distribution: size, arrangement, kind of ducts, pipes, and radiators. (S—Single ducts for each room; inlets 8-9 ft. above floor, outlets near floor.)

B. Fire Protection System—

1. Apparatus: fire hose, extinguishers, water pressure, fire alarms. (S—Adequate supply on each floor; fire alarms easily accessible, automatic in boiler-room, connected with city fire department.)
2. Fireproofness—
   - (*a*) Building as a whole: rating of underwriters.
   - (*b*) Stairways. (S—Encased fireproof stair wells.)
   - (*c*) Boiler- and fuel-rooms. (S—Separate fireproof rooms.)
3. Fire escapes: number, location, kind, protection, number of exits. (S—In non-fireproof buildings there should be at least two fire escapes.)
4. Electrical work: nature and place of intake, insulation, number and kind of outlets, location of switches, meter, cut-out, cabinets. (S—Should be installed according to rules of underwriters.)
5. Fire doors: kind, location, operation. (S—Automatically closing.)

C. *Cleaning System*—Kind, installation, efficiency. (S—Vacuum system.)

D. *Artificial Lighting System*—Kind, amount, distribution, number, and location of switches, outlets for lanterns, etc.

E. *Electric Service Systems*—
  1. Clocks.
  2. Bells and gongs.
  3. Telephones: number and location. (S—At least one on each floor.)

F. *Water Supply System*—Drinking-fountains, baths, lavatories, janitor's supply (on each floor). Installation and sanitation.

G. *Toilet System*—
  1. Distribution: location, accessibility. (S—Most on first floor, others distributed.)
  2. Fixtures: seats, urinals, washbowls, sinks, towel and paper holders—size, kind, durability, and arrangement.
  3. Adequacy: number. (S—1 seat for each 15 girls, 1 seat for each 25 boys, I urinal stall for each 10 boys.)
  4. Seclusion: soundproofness, doors.
  5. Sanitation: finish, material, workmanship, lighting, ventilating. (S—Material—not absorbent, non-corrosive.)

H. *Mechanical Service Systems*—
  1. Elevators (for buildings of more than four stories): location, fireproofness, adequacy.
  2. Book-lifts.
  3. Waste-chutes: kind, location, size. (S—Fireproof, outlets closing automatically.)

IV. CLASSROOMS

A. *Location and Connections* (to exit, drinking-fountains, toilet). Deduct for base-rooms and those above fourth floor without elevators.

B. *Construction and Finish*—
  1. Size. (S—Per pupil 15 sq. ft. floor space and 200 cu. ft. air space.)
  2. Shape: classroom 24x30x12 ft.
  3. Floors: material, condition (cracks, checks, splinters, loose boards, projecting ends), width of boards, soundproofness, cove, baseboard, surface, finish. Stone, tile, cement and other composition floors are bad for class- or study-rooms. (S—Should be battleship-linoleum, or hard wood, durable, well joined, and not dust-retaining.)
  4. Walls, ceiling: plastering, finish, texture, condition, picture mold, chair rail, kind and condition of dado. (S—Hard, smooth, non-glass plaster, with cement plaster for dado, avoiding grooves and ledges.)
  5. Doors: how opened, size, kind, lock, threshold, transom, number of exits. (S—Doors without thresholds and transoms.)
  6. Closets and bookcases: location, size, convenience.
  7. Blackboards: kind, length, width, color, chalk rail, height from floor, surface, quality, condition, trim. (S—Slate, full black, on

front and side of room, 36-42 in. wide, height of chalk rail, grades I-II, 24 in.; III-IV, 26 in.; V-VI, 28 in.; VII-VIII, 30 in.; high school, 32-36 in.)

3. Color-scheme: woodwork, dado, walls, ceiling, furniture, shades, finish, fixtures. (S—Neutral color, buff or green; dado slightly darker than walls, white or cream ceiling; woodwork, furniture, and shades to harmonize in tone; dull, smooth finish.)

C. *Illumination*—

1. Glass area: one-fifth to one-fourth area of floor.
2. Windows: size of mullions, nearness to ceiling, height of sill, kind of glass, distance of front window from front wall, orientation, shape. (S—From pupils' left, unilateral, grouped, symmetrical, as near ceiling as possible, 3⅛ to 4 ft. from floor, plain glass, mullions not over 12 in. wide. Front windows should not come within 5 ft. of front wall; easterly exposure best; rectangular in shape.)
3. Shades: kind, material, hanging, adjustment, condition. (S—Adjustable from center.)

D. *Cloakroom, Wardrobes*—Location, size, convenience, ventilation, finish. (S—Ample ventilation and accommodation.)

E. *Equipment*—

1. Seats and desks: kind, number. (S—Adjustable-movable or adjustable; not over 42 in number.)
2. Teacher's desk. (S—No platform.)
3. Bulletin boards.

V. SPECIAL ROOMS

A. *Large Room for General Use*—

1. Playroom: location, size, accessibility, adaptability, finish. (S—Per pupil 15 sq. ft. of floor space and 200 cu. ft. of air space.)
2. Auditorium—
   (*a*) Location, accessibility. (S—Should be on first floor.)
   (*b*) Construction: size, height, seating capacity, floor, acoustics, exits, obstructions, gallery (kind, seating capacity, location), light and nature of stage, finish, ornamentation. (S—For 80 ft. length on flat floor, stage should be 3 ft. 8 in. high; on dish floor, 3 ft.)
   (*c*) Auxiliaries: dressing-rooms, curtain, setting, seats (kind, arrangement).
3. Study-hall—location, size, accessibility (especially to library), adaptability, finish.
4. Library: location, size, accessibility, form and arrangement of stacks.
   (*a*) Kind, location, size, adaptability. (S—Depends on number of stacks.)
5. Gymnasium—
   (*a*) Location: accessibility, segregation of sexes.
   (*b*) Construction: size, floor, track, gallery, soundproofness, finish. (S—Height 22-25 ft. Length and width should relate as 3 to 2.)

(*c*) Auxiliaries: lockers, showers, dressing-rooms (number, kind, location, convenience, condition.)

6. Lunchroom: location, accessibility, size, adaptability, arrangement, finish, sanitation.

B. Rooms for School Officials—

1. Offices: location, size, adaptability, finish; waiting-room (ditto).
2. Teachers' room: location, size, toilet facilities, equipment, finish. (S—Equipped with chairs, couch, gas or electric plate.)
3. Nurses' room: location, size, equipment and toilet facilities (including bath), adaptability, sanitation, finish.
4. Janitor's room: location, size, convenience.

C. Other Special-Service Rooms—

1. Laboratories—

   NOTE.—Include all facilities for chemistry, physics, biology, physiography, commercial work, household and industrial arts.

   (*a*) Kind, location, size, adaptability. (S—Depends on number of pupils to be accommodated. A room 30x40 ft. will accommodate 25 pupils.)

   (*b*) Construction: plumbing, storerooms, cabinets, finish.
2. Lecture-room: location, size, seating capacity, plumbing facilities, accessibility, fixed furniture (number, kind, arrangement).
3. Supply- and storerooms—location, size, adaptability.
4. Studios: kind, location, size, and adaptability.

   NOTE.—Include drawing-, art-, and music-rooms.

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TEACHING EQUIPMENT

I. GENERAL—

- *A.* Maps, globes, charts, wall roller maps of world, continents, United States, state, and county since last census; 12-in. hanging globe; reading charts for system used; temporary charts, etc.
- *B.* Bookcases: built in or cabinet enclosed, glass doors with lock, special dictionary stand or holder.
- *C.* Display facilities: according to space and need, burlap surface (preferably green) yard wide, 3 feet from floor; wires above and below blackboard a good improvised scheme; glass cases or cabinets for collections.
- *D.* Library—
  1. Selection: should include suitable fiction, science, history, biography, and agriculture and household arts literature.
  2. Grading: children of primary, intermediate, and grammar departments well provided.
  3. Reference—
     - (*a*) Dictionary: unabridged, late edition, also small dictionaries properly graded, one for each two pupils above third grade.
     - (*b*) Reference: pupils' encyclopedia, 4 to 6 volumes.
  4. Government and state bulletins, suitable collection from U.S. Bureaus of Agriculture, Weather, Labor; Children's Bureau, Geological Surveys, Statistical Abstract of Census, State Departments of Education, Health, Agriculture, State Agricultural Colleges.
  5. At least periodicals as follows: daily paper, weekly magazine dealing with current events, farm journal, children's paper.
- *E.* Music—
  1. Instrument: piano, organ, or victrola.
  2. Books: good collection of standard songs with music, bound.
- *F.* Pictures and Decorations: few well selected and tastefully framed reprints of masterpieces, natural decorations in season, special decorations by pupils with evidence of suitable change.
- *G.* Industrial Exhibits: exhibits of manufactured products and processes, e.g. Baker's chocolate, Standard Oil products, Pillsbury's flour (stages of manufacture), cotton manufacture, silk manufacture, etc.
- *H.* Weights and Measures: liquid, dry, trip balance with English and metric weights.

II. SPECIAL DEPARTMENTS—

A. Primary—

1. Sand Table: 24 inches high, minimum area of 6 sq. ft., sand tight box with sides 4 inches high.
2. Materials: (1) papers of all kinds; (2) crayolas, water colors, brushes, etc.; (3) clay; (4) scissors; (5) rulers; (6) weaving materials; (7) word builders; (8) numbers; (9) sight cards; (10) sign printing set; (11) paste; (12) hectograph; (13) colored pegs, tooth picks, number blocks, etc.; (14) collected materials, e.g. pasteboard boxes, spools, etc.

B. Household Arts—

1. Cooking—
   - (*a*) Stove: oil stove and oven, kitchen stove or equivalent.
   - (*b*) Utensils: kettle, sauce and baking pans, strainer, kitchen knife, fork and spoons, measuring cup, salt and pepper shakers, frying pan, dishpan, garbage can, butcher and paring knives, potato masher, quart cup, mixing bowl, 2 plates, serving tray, tea towels, cleaning cloths, soap and scouring materials, food receptacles.
2. Warm Lunch—
   - (*a*) Dishes: individual bowls, cups, saucers, plates, knives, forks, and spoons.
   - (*b*) Table: suitable to be used for cooking as well, any suitable adaptation of other equipment.
3. Cupboard: dust proof, preferably glass doors, capacity for dishes, utensils, and supplies.
4. Sewing: space usuable for cutting, tape measures, shears, thimbles, needles, etc., storage facilities for materials.

C. Manual Training—

1. Tools: cross cut and rip hand saws, coping saw, jack plane, hatchet, block plane, tri square, framing square, carpenter's ruler, mortise gauge, hammer, screw drivers (4 and 8 in.), chisels (¼, ½, and 1 in.), ratchet brace, set of auger bits (1/16 to 1 in.) drawing knife, oil and carborundum stones, oil can, files, flat and tri pliers, putty knife, anvil, 8-oz. ball hammer, 10-in. monkey wrench.
2. Bench: substantial, minimum 2 x 5, two vises (one metal, one wood faced), drawers for tools.

D. Nature Study Materials: plant presses, insect jars (poison), bottles, collections of plants, seeds, woods, flower pots, etc.: magnifying glasses (minimum 1 for each five pupils).

E. Agriculture: (1) Babcock tester with bottles, pipettes, acid, etc., unless there are a number in the homes of the community; (2) seed testers for corn and other seeds; (3) tubing, etc., for capillarity experiments; (4) litmus paper for soil tests.

Demonstration of the Gray Reading Tests

(With Use of Lantern Slides)

C. H. JUDD, Director of the School of Education, University of Chicago

I WANT to suggest to you, if I may, that I am undertaking a rather difficult task in attempting to demonstrate reading tests to an audience. As many of you know from your own contact with these tests, they are intended for individual work.

It is expected that the child will be tested by the investigator in some quiet place where the investigator can watch the child at work and can make his observations on a single individual. In order to introduce you to the spirit of those tests and in order to get the opportunity to discuss in some measure the difficulties that are encountered in the administration of the test, I am, however, going to venture a few experiments with you. I am going to ask you to turn yourselves into the subjects of this test then, and as we come on some of the results of our investigation here we shall have an opportunity to comment on the kinds of difficulties that are encountered in giving these tests to children, and we shall also have an opportunity to comment on the results that come from these tests when administered to school children.

I am going to put on the screen, first of all, a table which I borrowed from Mr. Gray's monograph ("Studies of Elementary School Reading Through Standardized Tests," p. 102, Table XXVII). May I make one general acknowledgment? Most of the material that I shall use for the afternoon discussion is borrowed from Mr. Gray, and any of you who are interested in going into details will naturally turn to his original material. I say I borrowed this table from him.

You will see that Mr. Gray has worked out here nine passages. They are indicated by the titles in words above each section of the table: Tiny Tad, Nuisance, Brownie, Grasshopper, Open Well, Sand Hills, Ancient Ships, Ancient Builders, and Ancient Artillery.

If you will follow this table thru very briefly you will see the kind of results I am going to try to get here this afternoon and the grounds for my expectation that we shall get comparable results. These passages were used in the different grades. The grades are indicated over here on the left-hand side of the diagram. You see in the uppermost series three passages, passages which are relatively easy; in the second series are passages of the second degree of difficulty; and in the third series are the difficult passages.

Running over to the results we will merely glance for a moment at those lines which indicate the number of pupils that were tested in each of these cases. You see that a very considerable number of cases were employed for all of these different paragraphs: 118 in the second grade used Tiny Tad, and the passage marked Nuisance was used with

125 of the children. In the second column are given the words per second, that is, 1.16 words per second represents the rate of the second grade's reading of the first passage about Tiny Tad. The Nuisance was read at the same rate as you see, 1.17. Brownie is a little more difficult according to the results collected from these second grade children.

We come down to the middle passages. Here you see the results for the upper grades and you note that you have a more rapid rate of reading. That is, the children are now able to read 2.07 words per second in the Grasshoppers in the fourth grade. That is in part due to the fact that you are dealing with the fourth grade. It is in part due to the differences in the passage, but you have a more rapid rate of reading and again you can make comparisons between these different passages, and because you have the fourth grade in both of the different passages you can make a comparison between the easy reading and reading of medium difficulty. Thus you see that in Grasshopper the fourth grade reads at the rate of 2.07 words in a second. That same fourth grade read, as you see above, 2.4 words per second in Tiny Tad and in the other simpler passages.

In the Open Well, you have a passage read by the fourth grade again at the rate of 2.78 words per second, whereas the easy passage was read by these pupils at 2.13, that is, you have slight differences here. In this particular case you have somewhat more rapid reading of the Open Well passage than you did of the Nuisance passage. In that way we get some opportunity to compare the two.

We come down to this last row of passages, the Ancient Ships, Builders, and Artillery. Here you will see that the eighth grade reads at a very much more rapid rate than in any of the earlier cases. The eighth grade reads 3.06 words per second in the passage called the Ancient Ships while the Ancient Builders is read at the rate of 3.4 words per second. Here again you have the opportunity of comparison between the sixth and eighth in this group.

Mr. Gray selected these nine passages out of a series with which he began to work, and these passages were so nearly comparable to each other that he can make definite comparisons of pupils of all grades by requiring them to read the passages. If the Tiny Tad passage, for example, is given to a second grade which has not been tested heretofore, you have a background of results with which to compare this new second grade. Instead of calling his passages a scale, Mr. Gray uses the phrase "standardized passage," and I think he uses it with all propriety. The phrase means that one has a passage which has been used in various different grades, that has been used in various different schools, and we know something about it in advance, therefore it is standardized. You know what to expect, you know something about how easy it is or something about how difficult it is, and you know that because you have tried it out with a number of children. The advantage, therefore, of these passages in a new school would arise from the fact that you know something about them in advance.

I think that in general much of our testing could be elaborated if we got teachers sufficiently familiar with the spirit of testing to realize that one can make tests of this sort without standardized passages. If third and fourth grade teachers both make use of some familiar passage out of the ordinary reading book, those teachers can then compare the rate of reading in those two grades without going into any elaborate investigation and without trying to get results from schools outside of the one school in question.

I am going to try you, if I may, with one of these passages, and in order to do that I am going to make arrangements to have put on the screen the Brownie passage, as it is called. This is a relatively easy passage. When I give the signal it will appear and I want you to begin reading as soon as it appears on the screen. I will stop you at twenty seconds.

Presumably the reading of that passage ought to require between forty-five and fifty seconds, so that presumably twenty seconds is short enough a period so no one will get thru the whole page. Some of you may be very much faster readers than I anticipate. In that case I may need to go down to ten seconds for the experiment, but I want you to read it with the view of getting the meaning of it, because, as we say to the children in the class, we expect to ask questions about it and we want you to tell what is in the passage. Furthermore, I want you to read it as rapidly as you can.

How many of you finished the passage? Then I was right in the guess that twenty seconds was a short time, for no one finished the passage. Did anyone read only into the seventh line? There are a few. Did anyone read only into the eighth line? Four or five, I see. Anyone read into the ninth line, tenth line, eleventh line, twelfth? Did anyone read beyond the twelfth line? Very well, now you have a very fair distribution group there, you see, with the beginnings in the seventh line. Then in the next line you get a large number and from that time on in the next three or four lines you get practically everybody bunched together. That is, we have a group of persons here who are fairly homogeneous, altho there are some individual differences. The average is about at the tenth line.

I am rather surprised that we did not get more individual differences than we did. We passed from the seventh line into the twelfth line; that is a difference of a little less than one to two. Ordinarily, in a group of this sort, we find that the differences between different individuals reach as high a ratio as one to three. That is, the differences in individual reading are very great. Of course, there must be some explanation of these differences and the very interesting question arises: What is the source, what is the cause of these individual differences in readers? Such questions will engage a good deal of our attention because we are not interested in making these tests merely for the purpose of getting the test made.

I want to warn you in general against being so absorbed in the numerical results which you get from your test that you do not think of the explanations which go behind and beyond the test that you are trying out.

I am going to give you another passage, but before I do that I am going to ask how many of you have been trying any of these tests.

Several of you; how many of you have given these tests yourselves? How many of you are at all intimately acquainted with the passages? Not enough to complicate my tests.

Please keep in mind, now, your record on the first passage. This was the third of the easier passages and I assume that it was not familiar to many here. I forgot to ask whether anyone had seen that passage before. One or two of you have seen it. At any rate for our purposes it can be regarded as an unfamiliar passage. Now I am going to give you a familiar passage. The Tiny Tad passage is one with which all who have given the tests are familiar. Tiny Tad becomes so familiar a character around the University of Chicago that he is really a family name. One expects to encounter him in any one of the grades to which he goes, and our children are getting very familiar with Tiny. Some of us are equally familiar with him, so I am going to put Tiny Tad on in exactly the same form as Brownie and then I am going to see whether those who are familiar get over this passage faster than those who are not familiar with it, because, in general, familiarity is a very important condition in modifying rate. I am going to give you Tiny Tad for twenty seconds and ask you to read it exactly as you did before, namely, with the view of answering questions about it.

Did anyone read less than the fifth line? Did anyone read only into the sixth line? Four of you did. Did anyone read only into the seventh line? Four. Did anyone read into the eighth line? Six or seven, perhaps ten. Ninth line? Tenth line? Three or four of you read into the tenth line; eleventh line, three of you into the eleventh line. Twelfth line? Thirteenth line? Did anyone read beyond the thirteenth line? You see the two passages are fairly comparable. We get results somewhat as we did before between the seventh and the twelfth line.

Now I should like to ask this question: How many of you read more lines in this passage than you did in the first passage that I gave you? Nine or ten of you did. How many of you who read more, that is, how many of those of you who have just raised your hands, were familiar with the passage? Seven. Seven out of twelve were familiar with the passage. You see immediately that the antecedent preparation of a student results in a faster rate. The lessons which are back of that sort of result are, I think, of a good deal of significance, because it suggests one method of cultivating rapidity in reading.

How many of you read less in this passage than you did in the first passage? I see three hands. Were any of you familiar with this passage? There was not one of us who read that passage slowly who was familiar with the passage, and out of the twelve who read this passage rapidly, more than half were familiar with the passage, so we have here a very definite item of explanation. Thus one can use these standardized passages for purposes of this sort of analysis. We can carry this experiment still further. Since this passage has been before you and you have read it we will try it again. In this case you certainly will have a degree of familiarity which you could not have brought over from your remote experiences. I am going to ask you again to try conscientiously to read the passage as if you were going to answer questions about it.

How many of you got more this time than you did before? There you see is a perfectly clear demonstration. You see the difficulty of comparing the results of reading tests in the fashion in which you compare the results of arithmetic tests. You can repeat all the numbers there are in arithmetic, and if you prepare an arithmetic test of the sort that Mr. Courtis has prepared you can, in your series of numbers, get every single possible combination. It is quite impossible for you to prepare a reading test of that kind. It is quite impossible for you to determine all of the different combinations of words and sentences that could be brought to children in these different grades, consequently your standardized passages in this type of investigation are not exhaustive tests. You cannot be sure that you have covered every possible phase of reading, but you can compare children in the degree of their ability to recognize the meaning of passages and you can get the difference between different kinds of passages and you can also go forward with certain experiments, as, for example, the experiment of making them familiar with the passage in various ways.

I am now going to give you another type of experiment, one which deals with another aspect of the matter of familiarity. I am going to give you a different type of preparation for one other passage.

I have a passage called Ancient Ships. I am now going to try to make it familiar to all of you by telling you what is in the passage. We are going to talk about ancient battleships and as we go into the matter we shall find that the majority of ancient ships were battleships. Apparently the ancients, when they built boats, were more interested in war than they were in commerce. There was a sufficient hazard, evidently, in going on the sea, so that they went only on urgent expeditions. They built some warships that were very swift and very large. We find that the Romans and the Greeks and Carthaginians had these ships and we shall certainly be very much interested in studying about them. But those who have to do with modern ships, who know everything about commercial ships or war vessels, are particularly interested in these boats, and the surprising fact about them, when we begin to study them, is that they were as good boats as they were.

So much for the preparation. This is the type of preliminary preparation that is very frequently taken up with a class. I am going to ask you after this to read the passage for twenty seconds as before. We shall then get our statistics again. Did anyone read less than the fifth line? Two of you. How many of you read into the sixth line? Quite a number of you, I should estimate it fifteen. How many of you into the seventh line? Somewhat less. How many of you read into the eighth line? A considerable number of you, about as many as read into the sixth line. How many into the ninth line? Six. How many read into the tenth line? Eleventh line? Four hands. Twelfth line? Thirteenth line? Beyond the thirteenth? Now we have it again, you see we read about the same number of lines. There is this difference, you will remember, from the original table which we borrowed from Mr. Gray, that this is a more difficult passage than the one we read before. How many of you read in this passage more than you read in the Brownie passage with which we started? Sixteen or seventeen of you. Of those who read this passage more rapidly than you read the Brownie passage, how many were at all familiar with this passage from earlier experience than today's? Only two or three out of eighteen. Evidently training helped your reading.

I have seen very good fifth grade exercises given under practically the same conditions as these under which we are operating here. The teacher says to the fifth grade child, "I am going to give you a passage to read about such and such a matter and I want you to read it as rapidly as you can, then I am going to ask questions about it." I think this sort of experimentation with all classes would make very good routine exercises and one finds that one can in this way speed up children in their silent reading. For training in silent reading we have had until lately very little methodology. We have very good methodology for our oral reading, but we do very little of this sort of thing with silent reading.

I am going to ask you to read this passage a second time for the purpose of seeing whether the familiarity that you gained from exposure to this passage helps you in addition to the training I gave you a moment ago in reading this passage more rapidly. How many of you got beyond the thirteenth line? You see practically everyone here.

Next we will take a passage that belongs in the same category with this Ancient Ships, but is unfamiliar to you. I am going to put that on the screen in order to see how much you gained from the familiarity that I tried to give you by discussing the passage and the familiarity that you acquired from contact with this passage.

Did anyone read more of this than he read of the Ancient Ships? One or two. Now let us go back. I want to find out, if I can, how many lines of difference there are. Since you did not read more, you read either the same or you read less of this than you did of the Ancient Ships. I am going to ask you to show your hands on the number of lines less that you read in this second pasasge. Remember you had two chances in Ancient Ships; your first reading depended for its fluency on the instruction that we had about the passage in a general way. Please compare this reading with the first reading of Ancient Ships. How many of you read as much this time as you did in the first reading of Ancient Ships? How many of you read as much or more? Two or three cases. The rest of you now read less. How many of you read one line less in this case? About nine of you. How many of you read less by two lines? Seven. How may of you read less by three lines? Six. How many of you read less by four lines? One. Did anyone read less by more than four lines? Two. You see a difference of three, four, and five lines, due to the training that you got from a preliminary discussion.

The differences in reading which one measures by these standardized passages are sometimes due to outside influences, to the kind of influence that comes from familiarity, and when you use standardized passages for reading, you must recognize the fact that you are using up your material. The difference between a reading scale or a set of standardized passages for reading and the scale you use in arithmetic will, I think, be perfectly clear to you when you consider such facts.

I am going back to comment on some of the devices that Mr. Gray has employed in dealing with this passage as it is ordinarily used. A great deal of the material that is used in schools is not arranged so that it is easily tested. A teacher can overcome a great many difficulties if she will measure the time consumed in reading a passage by the device that we have just employed. We used, you remember, a constant time and you gave a variable number of lines read. Now we can exactly reverse that arrangement and try the experiment by isolating in the middle parts of this passage one hundred words. Mr. Gray has had the passage printed so that he has just one hundred words in the middle column, that is the fixed quantity, not the time as we used it a moment ago. When one thus uses a fixed quantity of material one allows the time to serve as the measure. You can use anything as a measure provided you will arrange your material in such a way that you get a definite result, a definite result that will be comparable with the same type of result in another case.

By printing one hundred words of this passage in a separate column we make it possible to determine with great nicety the length of time involved in reading one hundred words. There are certain other advantages which come from printing the columns in this way. In the first place, the preliminary short column gets the student under way in reading, a condition that is very desirable. Students need warming-up exercises and here is an opportunity for them to warm up. In the second place, you do not distract him in order to get him started. You merely start your watch when by watching his eyes .you see him begin the one hundred words.

Suppose you had an ordinary reading exercise for the class and you wanted to measure the rate at which the children read. You can do it in the same fashion by noting quite unobtrusively on your watch when a child, who is reading aloud, is at a certain point, and what time it is when he ends. It is more difficult to do this when the pupil is reading to himself, but you can determine by watching his eyes when he is at the top of a page and then you can take his time again at the bottom of the page. You can make many incidental observations on children when they are working under ordinary circumstances.

One of the most entertaining and illuminating reports ever made in one of my classes was by a student who went to the library of the College of Education and observed some of the members of his own class reading. He went ahead of the members of the class and read two or three pages of an assignment that had been made to the members of that class, so that he knew how long a time ought to be required by a student to read a page of printed matter from that particular book. He then went down with his watch in hand, took notes on what happened, and came back the next day with a most entertaining account of what he had observed. What he observed ran something like this: It takes, say, three minutes for a very deliberate reading of one page. He noted by watching the eyes of his classmates that they began to read at the top of the page; they read down a little way into the page when they were distracted by something. The interesting question is: Where does the reader begin again when he comes back to the page after a distraction? If you will watch his eyes you will see what is going on in his experience. Sometimes he rambles around and tries to find where it was he left off, when the distraction came; very commonly he goes back to the beginning of the paragraph. In many cases he goes back to the beginning of the page. You can observe his eyes and see that sometimes he runs rapidly over the part that he has read, sometimes he reads it over with the same deliberation that characterized his first reading. You can determine what is the character of his second reading by noting his time. If he reads it over rapidly, merely for purposes of locating the point at which he left off, you will know it by the short time required. In like fashion follow his other variations and delays. Thus you can take the sum total of the time he spent on the whole page. Instead of spending the three minutes that are necessary for a very deliberate reading of such a page you will find that frequently the reader will spend ten minutes and that ten minutes will involve a great many periods of so-called thinking about the last page.

Observations of that sort are of great importance. If a teacher wishes to answer the question as to whether all parts of a passage assigned to a class are of equal difficulty, let him set the children studying before him and watch them. Let him observe first a bright pupil and then a dull pupil and he will be able to discover by the rate of reading when the matter is difficult and when the matter is easy. If the ingenious teacher would do a great deal of this sort of work he would get the advantages of tests and measurements even when he is not dealing with standardized passages. We ought to get the teachers thoroly acquainted with the significance of this sort of work, because once they see that these symptoms which we are emphasizing in the test are real symptoms of successful reading; once we get them to realize that the testing of a passage is not something entirely outside of the ordinary routine of the schoolroom work, we shall have very much more intelligent testing to begin with, and in the second place we shall have an intelligent interpretation of what the children are doing and what the school is doing.

Suppose one finds that a child reads very slowly in a test. If the teacher has been using this method of testing all thru her routine work she will be in a position to understand that slow reading is a symptom of difficulty. If the passage is familiar, as we have just shown here in our own experiments, the student gets the contents of the passage very readily. Such experiments and conclusions give very important hints to the teacher with regard to methodology.

What would you do if you wanted to help children to read rapidly? What is the most obvious step that you can take? Evidently you can let the children read the same passage over several times and if the passage is read several times in succession there will be a gain in fluency, in rapidity of reading each time the child reads. I say I know of no better way of demonstrating to a group of teachers that the rapid reading which students exhibit when they are expert readers is directly connected with a higher degree of intelligence.

I should like to try one more experiment, and in order to try this we shall use one of the passages of medium difficulty, one of the group which was used with the intermediate grades. I hope you still have in mind your record of the Brownie passage, the one we read first of all. Also I hope you remember your record for the Ancient Artillery which is an unfamiliar passage of the hard type. I am now going to give you a passage of the intermediate type.

How many of you read only into the fourth line or less? How many of you read into the fifth line? Six or seven. Into the sixth line? seven of you. Seventh line? How many into the eighth line? I should say ten. How many of you went into the ninth line? Tenth line? Three. Eleventh line? A few. Remember we stopped on the tenth line in the Ancient Artillery, so that is very good, and you remember some of you went to the twelfth line in the Brownie passage. How many of you got into the twelfth line in this case? Did anyone get beyond the twelfth line?

Now so far as the general averages are concerned, that turns out very well, that is, so far as the extreme cases at any rate are concerned. It turns out very well, because Brownie went to the twelfth and this went to the eleventh and the Ancient Artillery stopped at the tenth.

Now make individual comparison, if you will. Let us compare in both directions. First, with regard to the number of lines read in the Brownie passage, as contrasted with this last. How many of you read an equal number of lines in the Brownie passage and this passage? Five of you. How many of you read more lines in this passage than you did in the Brownie passage? Five. How many of you read more in the Brownie passage than you did in this one? Eight. That is about the sort of results you get. You never get in these reading tests, in fact, in any test, an overwhelming verdict in which every individual is involved. What you will get will be something like what we got here; you will get five or six persons who read equally even when the passages are known to be somewhat different in their weight. You will get a certain number of persons who reverse the expected results but you will get a preponderance which makes the mass result.

It is always a mass of results that you are dealing with in your first measurement. You can use these mass results for purposes of the type of analysis that we have been discussing before, but to make your study complete you must ultimately come to individual analysis. Comparing the last passage read with the Ancient Artillery passage, how many read the same number of lines in these two cases? Two. How many of you read more of the Artillery than you read of this? Eight. How many of you read more of this than you did of the Artillery? Fourteen. There again you see there are cases that reverse our expectations, but we get a preponderance of cases of one type in the midst of all this complexity.

Some persons are disposed to criticize the measurement movement in education, because they say one does not find as a result of these measurements anything about the single individual. I believe myself that we have to refine the methods of our measurement if we are going to get diagnoses that will help us in dealing with a single individual. But after all the school problem is a problem of dealing with a group of children and any method that will help us to go in the classroom and determine in a general way what is going on in the group as a whole will be very significant for school administration. I should say, therefore, that these tests are immediately useful for purposes of school administration. Tests have been used for purposes of school administration more than for purposes of classroom methodology.

The distinction is worth drawing. Sometimes teachers are very restless in their work with these tests, because they are not able to see how they are going to improve their work by means of tests. I think we ought to acknowledge frankly that tests deal in their present form with mass facts. We ought to begin to extend these tests in such a way that we shall make an analysis of individual cases. I think the superintendent can use the tests, as they are now developed. Standardized passages must, however, give results which will show the teacher some return for her arduous efforts in carrying out these mass tests. In order to satisfy this demand we must go beyond mere massing of class averages. We must work out some experiments such as those on familiarity described above. You may be satisfied from the administrative point of view, with a gross result involving the group as a whole and showing a preponderance in one direction, whereas your teacher will want to carry that into more detail and will be interested in getting an individual diagnosis. Therefore, what I am going to advocate before you in some of the later discussions is an extension of these tests, a continuation of experimental endeavor in the effort to work out demonstrations that shall be helpful in modifying actual school practice.

There is one matter of methodology on which we should comment. There are two ways of checking up the children's retention of the passages which they have read. Either pupils may be called on to reproduce freely or they may be asked to answer a series of questions.

One of the most significant lessons that we get from all of our testing work with children is that they have only a limited span of attention. You must be very careful when you try a test not to overtax your child because the results you get after a child's interest and attention have been exhausted are very much biased results.

If you let a child read a story and ask him to reproduce what he has read, you will find in every case that the child will begin by reproducing with a good deal of detail what he found at the beginning of the passage. You will find that toward the middle of the passage he becomes briefer and briefer, and you will find that the end of the passage, which psychologically ought to be clearer in his thinking than the beginning of the passage, will be very meagerly reported.

One of the teachers in our school tried an experiment in order to find out the meaning of the fact on which I have just commented. She led the children thru the various steps which they must follow in going into the keep of a castle. The children were taken across the drawbridge, over the moat; they went thru the porticullis; they came into the court, into the doorway, and down the stairs into the dungeon. Then she asked for a reproduction. The pupils wrote in great detail how the traveler approached the moat, how he went over the drawbridge, how he got thru the porticullis, and then they began to get very brief, and the trip to the dungeon was completed without very much ceremony. We should be mistaken in assuming that the children did not know about the end of the journey. This the teacher brought out very clearly by taking another class, giving them the same passage and asking them to tell how one would come out of the keep. This time it was the portcullis and the moat and the drawbridge that got short shrift. The pupils are not able to sustain attention for the end of any story. Their attention is worn out and that is why if you are going to estimate a child's ability to interpret passages you must not depend merely upon his powers of reproduction; you must in addition give the child some questions. The question is a device for distributing the child's attention over the whole passage. One cannot conduct a test properly and ignore the human factor that is being tested. You must recognize the fact that the result that comes out of your test is dependent, first, on the material that you offer the youngster; secondly, on the ability of the youngster to receive and retain that material; thirdly, on the ability that he will exhibit when he tries to reproduce the material; and you must take into account in your testing each one of these different factors. You must have the right kind of material to give the children; you must give it to the children in such fashion that it does in some fashion comport with their ability to receive that material; and then you must give heed in your testing process to the child's method of reproducing what has been given to him. In short, you have in your testing constantly to keep in mind the kind of internal processes which are called out by these tests.

Reading Tests

C. H. JUDD

I AM not going to talk about tests but about some supplementary studies that I think can appropriately be added to the tests.

After one has determined by means of tests where a weak reader is, or, on the other hand, after one has determined the grade in which best reading is done, or, still better, after one has determined his strongest individuals, then the problem is clearly opened up for detailed investigation.

We ought to take the individuals who can read very well and study them. Then we must take the individuals who read badly in order to find out what the difficulty is. In order to make clear to you the laboratory methods that can be employed in furthering these analyses (some of them are rather elaborate methods) I have brought along several photographic records of eye movements.

This particular film that I am going to show you is a strip of ordinary kodak film that has been passed mechanically thru a camera, in front of which sits a reader, in this case an adult. The reader is reading an ordinary passage, and the photograph indicates where his eye was at any given moment as he goes across a line. We have here that part of the film which shows the eye movement involved in a single line of reading. The line in the photograph shows the movement of the bright spot in the eye. Whenever you look at a person's eye you know there is a spot that you can distinguish as a bright spot. You see it in any picture of an eye, and in this particular case we have controlled the bright spot carefully by sending a beam of light from a proper source —an arc light—to the eye. When that beam of light is reflected into the camera it can be readily photographed, and whenever the eyeball moves backward and forward that beam of light travels. That is, the bright spot moves with the movement of the eye so that we have here a permanent record of the way in which the eye is doing its work as the reader goes along a given line. The film travels vertically, and the spot of light as you see traces a line on the moving film. Where the eye does not move, the spot of light is also stationary and we get a straight line or approximately a straight line. When the eye moves to right or left we get a corresponding line. The long jump shown at one point carries the eye to the beginning of a new line. You will notice that this line is made up of a series of dots; those dots are produced by placing a vibrating tuning-fork in front of the arc light; that sends the ray to the eye. This tuning-fork vibrates at the rate of one vibration every fiftieth of a second, so that each spot means one fiftieth of a second.

We are interested in following the eye as it reads a line of printed matter. Note that the eye pauses for a little time here while the reader recognizes the word or phrase, then the eye moves forward, fixates another point in the line, jumps forward, fixates another point, and so on. By means of such a photograph we can determine the number of pauses that are made in a line; we can very readily measure the length of each one of the pauses, and we can see by projecting this on to the reading matter exactly where the eye was fixated at any given time. The other line that is on the film represents the check line. In order to make perfectly certain where we are on the printed matter, we fasten a bright spot outside the eye; this does not travel at all and gives us a continuous straight line.

Here is another slide which will give you a different kind of eye movement. Contrast the sort of movement that we have here with the sort of performance I showed you a little while ago. We have an eye movement in this case that is wholly different from that shown before both in the number and in the duration of the pauses, and if you go into it in some detail and measure the length of those various pauses, you will find that you are dealing again with a difference that is fundamental. The explanation of the slides is that in the last one the person was reading aloud and in the other he was reading to himself. In oral reading the trained reader usually looks at each word; he looks at a word and pronounces it, and so on. What he does when he reads silently is to take certain long steps; these are determined not by the demand that he shall move his vocal cords for each single word; the steps that he has taken in silent reading are determined by his ability to perceive or recognize certain combinations of words.

The unit is entirely different in the two cases. The unit in the first case is the unit of pronunciation, in the last case it is a unit of recognition.

Before we discuss the further details of this matter I want to run rapidly thru the lantern a number of slides that will show you certain other aspects of the situation. Here is a diagram that I borrowed from Mr. Gray. Mr. Gray tried the very simple experiment of seeing what the effect would be of asking the children to study the passage. If you give a child a passage to read and test his ability without any preliminary preparation whatsoever you will get the kind of a record that is represented by the full-drawn line. Let him study the passage, let him become somewhat familiar with it, and what is the result? If the passage is one which the child can readily comprehend because the words that are included in the passage are all of such a sort that he understands them readily, you get some such result as we got this afternoon. That is, this afternoon, you remember, when you studied the passage you improved in your ability to read. So here the children have improved in their ability to read. The lower part of the diagram shows what happened when the pupils dealt with a difficult passage. The interesting fact now is that when you tell little children to study a passage which is very difficult they do not do as well as they did before they had studied the passage. Tell little children in the second and third grades to study the passage and you get an effect which you see is exactly the reverse of the effect you get in the upper grades when the children study difficult passages. You are dealing here with the ability to understand the passage, and when you ask children in the lower grades to study a passage, they do not know what you are talking about. They study the formal side, they learn more about the pronunciation of that passage, and they do not pay attention to the meaning of the passage. Consequently after little children in the lower grades have studied the passage they can pronounce it better, but they are not as efficient in understanding its meaning.

Two entirely different situations, then, arise in the lower grades and in the upper grades. You tell a little child to study and he thinks you mean to study how to pronounce the words, and he is distracted from a recognition of the meaning of the passage by attention to the formal side. You tell a child in the upper grades to study a passage and he knows that you want him to learn to interpret the passage. Thus we see that interpretation of a passage and reading a passage may be two entirely different matters. This is not unlike the fact which we discovered when we were dealing with eye movements.

Let us take up one or two other matters, and then we shall come back again to the general principles that are here involved. Here is a diagram [not published here] that was published in the Cleveland report. All of the children who were tested in reading in the Cleveland schools were divided in such a way that we have in the section across the top of the diagram the records of 25 children out of every 100. We have in the middle section of the diagram a representation of the record of 50 children out of every 100. We have in the bottom section of the diagram the remaining 25 children out of every 100. The horizontal levels represent different qualities of reading. That is, the 25 children at the top are the 25 best readers out of 100, that is the 25 per cent who understood the passage best. The mediocre 50 are represented in the middle horizontal division of the diagram; the 25 poorest readers in point of quality in the lower horizontal division. The diagram is divided into vertical sections in the same general way so that we have here the 25 children out of the 100 who are rapid readers at the right; the 50 out of the 100 who are mediocre in the middle, and the 25 out of 100 who are slow at the left. The diagram is put together for the purpose of showing us where the children are who are rapid readers and at the same time good readers, and so on thru the list. We find that out of 25 children who are good in quality 10 of them are among the most rapid readers. Eleven of them, you will notice, are the children who are mediocre in speed; only 4 of that 25 are slow in speed. Conversely, when children are poor in quality they are relatively seldom rapid in speed.

What does that mean? It means a good many things. Two statements, perhaps, we can select from the many that ought to be made, and they are these: There are some children who will be very good in quality, but they are slow in speed because they are temperamentally phlegmatic. The slow, steady child is good in quality; he does his reading well, but he is slow in speed because he is slow in everything that he does.

In our school at Chicago we have been working with poor readers. We have had a girl in the fifth grade who is very slow in all of her reactions; she is very steady, she does her work well, but nature did not make her capable of unlimited improvement in speed. There will be in every class a certain number of children of that sort, and it is important in dealing with these tests and with the results of our ordinary school work that we recognize that there are individual differences which express themselves, as indicated along the upper section of our diagram. There are certain differences that nature has then provided; that is one fact that can be stated with perfect clearness.

The other fact which we ought to emphasize as of major importance is this: When a child cannot read well he is doing something that is analogous to that which he does when he stumbles physically. He is intellectually clumsy and clumsiness requires time. If I should try to walk from here to the door, and in doing so got in my own way, if I stepped on myself and was otherwise very clumsy about it, it would take me a long time to reach my destination. On the other hand, if I can go from here to that door without in any wise interfering with myself, I shall do it rapidly. The more rapidly I can get from here to the door the more economically I shall carry on my work. That is the typical fact in reading. The child who is slow and clumsy, who gets in his own way intellectually, will be a child who will not be able to carry away any of the meaning of the passage. That is what is shown in the lower section of the diagram where one sees the children very slow in speed, poor in quality, not at all like the pupils who are slow in speed but good in quality. Those children were phlegmatic; these are undeveloped.

Carry this statement back, if you will, and relate it to the fact on which we touched at the very beginning of our discussion. When you try to read orally you are engaged in doing something that interferes with the reading process, because if you are reading orally you must gauge your eye movements to correspond to the rate of your vocal apparatus, and your vocal apparatus is relatively very much slower than your powers of apprehension. The result is that when you are reading orally you are making yourself do another piece of work that gets in the way of your understanding. You find that you are very much more rapid in your silent reading, you are very much freer from distraction because you do not have to wait for your vocal cords; you are very much better able to get the significance of the passage. Does not this throw light on the sort of training which we ought to give in the schools? We ought to train children in the mastery of silent reading because it is the efficient rapid form of reading, free from distraction, free from the necessity of those slow laborious eye movements.

I have another diagram which I want to put on the screen. It is a familiar record to many of you; it shows in the full-drawn line the record of the group of schools which Mr. Gray uses as his standard. The broken line shows the record for the Cleveland schools.

If we parallel this record of quality with another record which shows speed and if we then add the record of oral reading in the Cleveland schools we have a full explanation of the whole situation. Cleveland emphasizes the formal side of instruction and neglects to train in the apprehension of meanings.

The evil results of this lack of emphasis on meanings becomes most evident in the fourth grade. This is always a crucial grade. The primary grades ought to prepare a pupil to read for meaning. If anything goes wrong in the primary grades, the fourth grade will reveal the trouble in most acute form. If, on the other hand, the work of the primary grades has been well done, the fourth grade will show a type of interest in meaning which calls for special recognition in the instructional methods used in the schools. Formal training should begin to give way to greater emphasis on meanings.

Four sets of facts have been laid before you. First, you have been shown that there is a striking difference between oral and silent reading in the type of eye movements involved and the time consumed. Secondly, there is a radical difference between the way pupils in the primary grade and pupils in the upper grades study passages. Thirdly, rapid rate and fluent reading show in general a high grade of ability while slow reading is usually clumsy reading. Fourthly, whole school systems may show an overemphasis on the formal side of reading.

These facts were brought together for the purpose of showing that the reading process is a complex one and that teachers, if they are to deal intelligently with pupils, must analyze this complex process and deal with each aspect of reading with full knowledge of what is involved. Oral reading is different from silent reading; clumsy reading must be overcome. Emphasis must be on meaning.

I would encourage you by every means in my power to make tests and more tests, but your results will profit you little if you do not turn instantly to the analysis of school situations and to the study of methods that shall improve reading as it appears in individual pupils. The testing movement must affect practice.

Experiment in Education

C. H. JUDD

I HAVE great respect for the capacity of an interested audience. The amount of education material that has been launched in your direction today seems to me to be prodigious, and whether you are prepared now to enter on anything like the discussion of a new theme I seriously doubt. I sympathize with the comments of my good friend Professor Strayer. Of course we realize, those of us who are enthusiastic about this survey movement and about the experimental movement, that in the minds of many the wisdom of this movement is seriously questioned. I heard the verdict, briefly put, by one of the victims of the survey movement. A man who all along had felt that the survey was not needed in his system and shortly after the survey had been completed was judged by the school board not to be needed by the school system, said: "Surveys are good things; they give employment to a certain number of persons who would otherwise be public charges."

It is not without opposition that this scientific movement is going to work itself out and I should like to be able, if I can briefly, to try to reconcile two notions about scientific work in the schools that in the minds of some persons are antagonistic. I deem this opportunity a suitable one for this statement, because, as we all of us realize, we are greatly indebted to the head of this institution for having carried on one of the first great experiments of a laboratory type in education. I also appreciate the opportunity of expressing to President Bryan the personal satisfaction with which all students of the science of education refer to his investigation of the telegraphic language. Every time I teach a class in educational psychology and commonly whenever I make an address, I have occasion to refer to it as one of the most substantial, one of the most illuminating, one of the most interesting examples of the possibility of a laboratory experiment with educational applications. If we recognize that experiment must in some measure be carried on in the laboratory; if we recognize that it is possible for scientific method there applied to give us suggestions that can be carried out in school work, I believe we must also recognize the fact that it is possible for experiments to be made in schools which are thoroly scientific in temper, which come back to the laboratory student with suggestions that are full of lessons for his guidance.

Every teacher who is progressive in schools is experimenting. Not every teacher who is progressive in schools is experimenting scientifically and, therefore, there arises in the minds of some of our educational persons a feeling of opposition between the laboratory student who works at some special problem and the investigating teacher who is eagerly working out some new method. Can we not join these two forces in a single type of scientific undertaking; can we not say to the laboratory student "You should carry out in some detail this and that investigation, but you must so present your results that these results shall be useful in guiding educational methods"? And shall we not say, on the other hand, to the aggressive teacher who is experimenting with methods of teaching reading or some form of discipline in the school, or other practical problem: "You are also a fellow worker with the scientist in his laboratory. What you need is to follow your investigation with that keen spirit of criticism that is characteristic of the scientific laboratory and you can turn your results, collected in the classroom, into the finest type of scientific material."

I believe there is no fundamental opposition between that body of practical experience which is being collected by our educators and that type of scientific inquiry and criticism which we are trying to work out in this new professional movement, which we are here to represent and celebrate.

Let me offer, if I may, two or three illustrations. I came here to discuss reading; if you are not tired of reading, I am not and we shall try that again. I am willing to discuss reading all the time, because I am perfectly certain that reading is one of the fundamental subjects, if not the fundamental subject, in the schools. Our American schools are reading schools and they have been reading schools from the beginning. I like in this period of nationalism, when we are trying to define the spirit and temper of all that we undertake in this country, to come back to the conviction that we are making a definite contribution to the world's culture by the type of schooling that we have developed in the United States. If you go to the common school in Europe and observe the method that is employed in instruction in those schools, you will be led back logically and necessarily to the historical beginnings of those common schools and you will find that they were catechism schools. You will find that in those catechism schools of Europe the instruction was given by the teacher by word of mouth and the questions put by the teacher after instruction had to do with types of information accepted from authority.

If, after making that observation, you come back across the Atlantic, you will find that when our Puritan forefathers established American schools they said one thing was necessary. They said every individual child shall be brought into direct personal contact with the source of all religious belief and they established schools for the purpose of teaching children how to read the Scriptures. When they established schools where children shall themselves read the Scriptures, they put an end forever to that type of training that depended upon authority, that type of training that meant that the child must learn exactly what is stated by authority and must repeat verbatim what authority has given. When these children back in old New England began to read and when later that reading matter which constituted the limited subject of instruction in the New England school began to expand so that it included ultimately history, civics, and science we had the unmistakable signs of a growing democracy. The spirit of Puritanism which made of American schools reading schools where the child shall formulate his own opinion in direct contact with the sources of material prepared the way for the growth of independent public opinion as it has never been prepared for by any other device of civilization.

I, for one, am perfectly willing to talk about reading all the rest of the day, and I think the problems of reading can be used admirably to show what is going on in the laboratory and to make clear the practical significance of laboratory experiments. At the same time it is easy to draw a great body of suggestive scientific material from the experiences of teachers of reading who are training the children in the schools. If from these two points of view we see the possibility of developing a scientific method of treating reading which shall improve the work of our schools we shall have ample justification for the scientific movement which we represent.

When we try an experiment in the laboratory we take reading material and print it in fine type and in middle-sized type and in large type, and then we ask someone who can read to sit before a camera and read this identical passage in three different kinds of type in order that we may find out how he does it.

You say that is a ludicrously simple performance. Yes, but let us be patient and see what the results are and see what are the implications of these results. When a trained adult reads the same passage in three different kinds of type, he reads those passages in exactly the same way. Think that over and I believe you will begin to realize that it means a great deal.

Let us use a few psychological terms if you will. Suppose the reading process was concerned primarily with sensations. Your psychologist means by a sensation the impression that is produced on the eye. Suppose reading were a process controlled by sense material, how would a person read if he got a great deal of sense material from large type in one case, and very little sense material from the fine type in another case? If reading were a process controlled by sensations we should get a different kind of eye movement with each change in type. We should get a different kind of reading process when the type is large, when it is middle-sized, and when it is small. But we do not get different types of eye movements. We get the same kind of reading process; we get the same number of pauses.

I dare say one could increase the type to such a size that one would have to look at the individual letters. As I go down the street and see an illuminated sign I sometimes have to stop and spell it out. I am not talking about those extravagant enlargements that are involved in such a case; I am talking about enlargements which double the type.

Our results show that the trained adult is not controlled by the sense material. He is concerned with what we call in our technical psychology "a perceptual unit". A perceptual unit in reading is something that is determined by what the reader brings to the reading process. When I read an ordinary passage and am trained in the reading process I take in at each glance a certain unit from the page and when I move my eyes to the next position I take another unit. How large a unit can I understand and apprehend? Just so large a unit as I am prepared by my experience to take in. We have long known that the unit of perception for a little child is different from the unit of perception for an adult. The unit of perception grows in the course of experience. We have perfectly definite evidence of that, and when you come to an adult who has learned how to read you find that he has a unit of perception which is so superior to sense material that he is not controlled by such sensory units as letters or even words. He has the reading within him. His units are determined by what he contributes.

Let us see whether there is any kind of change that we can produce in our reading matter that will change the unit of perception. We can do that very readily. All one needs to do is to ask a person to read numbers and one has a situation that is wholly different from the situation set up when one asks a person to read sentences. No one can read numbers in large groups. Even a trained adult cannot do it. Stand before a long series of numbers and photograph the eye while reading single numbers as 8, 7, 6, 5, 4, and so on and the result shows that the eye rests on each number. Now group those numbers together and say 876 and you will find that the perceptual unit, even when you read 876, is a very small one. It is not always a single digit, but it is very commonly a single digit even in a trained adult who tries to read numbers. The reading of numbers is perceptually a wholly different process from the reading of words. You see what I mean by a perceptual unit and do you see the possibility of modifying a perceptual unit by the kind of material that is presented?

May I offer another illustration? Suppose I take letters that do not constitute words and throw them together in a miscellaneous way and try one of the experiments that has been common in the psychological laboratory, the experiment of marking out.

The common experiment requires one to take a miscellaneous line of letters and mark out the a's. The subject grows very skillful in recognizing the a's but even here he does not take in at a glance the large groups that he does in reading. For the reader letters are grouped into words, but when one is looking for a's one cannot group letters. When one is looking for a's one has changed the motive entirely. The perceptual process involved is an entirely different process from the reading process. I might go on and elaborate that indefinitely.

You can get a different result in reading if you tell a person in advance that you are going to ask him to answer questions and you want him to read very carefully. He goes about his reading in a fashion that is wholly different from the fashion in which he goes about his reading when you merely tell him to read. Thus we find that we can go to our laboratory, and if we study a trained adult, we find that the reading process in the trained individual consists in a very large measure in what the individual brings to the situation and we must define the various kinds of reading processes according to their different motives and different types of material.

You say the teachers have known this all along, and I think they have half known it all along. They have half known that there is a difference in the reading process when you have one motive behind it and when there is another motive behind it. There is a fundamental difference in the way in which a child attacks a page when he is going to read merely for the purpose of the pleasure he is deriving from that reading and when, on the other hand, he is going to read for the purpose of preparing to answer questions.

We have known this fact in the schools, but have we known in the school how to induce those changes in a fashion that shall comport with the demands of human development? Have we known at what grade one can ask a child to exhibit this internal process of mastery of reading situation that shall make it possible for him to change without distraction from large type to middle-sized type, to small type? Have we been able in writing our primers to determine what is the size of type most useful for school work? We have indeed determined some of the gross hygienic demands with regard to size of type, but have we determined the best mode of arranging this material so that it shall be recognized by the child without disturbing his mode of recognition?

May I use a very simple analogy, one that you can observe with any child? You and I can write and do write with the same kind of handwriting, whatever the position in which we stand. My handwriting is characteristically the same whether I write from a position that I now occupy before this desk, or whether I rest my arm on my desk as I do under ordinary conditions. I can write in a cramped position; I can write on a poor piece of paper; I can write my characteristic type of handwriting under almost any circumstances that you can set up for me. Why? Because I have the habit within me. I am the master of my writing habit. These external conditions may disturb slightly that habit, but there is so much momentum back of that habit that I am master of almost any situation in which I find myself.

Did you ever try the experiment with a little child who has just been writing for a little time? You will find if you change the tool which he uses in his writing, or if you change his position with reference to the writing material, you modify his form of handwriting so as to get a characteristic difference. He does not have the handwriting habit within him.

When my colleague, Dr. Freeman, makes an investigation of adult handwriting he expresses his results in the technical terms, "I find a rhythm in the handwriting of one who has acquired the ability to write. I find certain individual methods of coupling the letters together. I find that the long practice," he says, "of training in handwriting has given to the adult a mastery of certain combinations of letters so that he no longer writes the letters as separate units, but he writes them as large coördinated combinations."

What is true of the mature writing habit is true of the mature reading habit. The pupil learns by long contact with reading matter to come to the reading situation with certain internal habits that cannot be disturbed. You disturb the reading habit of an adult a little if you turn a book bottom side up, but the disturbance does not last for any great length of time. You disturb the reading habit of an adult a little if you print your lines vertically instead of horizontally, but the disturbance is not great. Try that same experiment with a child and you find the child is absolutely without the preliminary habit of perception that makes it possible for him to master easily the novel situation.

Such discussions lead very naturally to a practical school problem.

We are led to ask, When does that period arrive in which a child has mastered reading enough so that you have a right to describe him as a matured reader? I think you all know the answer to that in a vague general way. Somewhere in the fourth and fifth grades the child has "arrived," he has gone thru the drudgery and training of those primary years, usually he has gone thru some sort of phonic analysis, and has learned laboriously how to couple together his letters and words into sentences and phrases. He has mastered the art of pronouncing these symbols which he sees on the printed page; and there will come a time inevitably, in the fourth grade or fifth grade, when as master of his own habits he is no longer willing merely to learn. He wants to apply his habit. He wants to do something.

Our laboratory experiment shows us how critical is this period of change for it will be remembered that with every change in motive of reading there comes a change in its form. The laboratory, when asked what it means that the pupil has matured a habit, has cultivated a unit of perception, will answer, He has developed an individual mode of attack upon the printed page. The laboratory will give you many a suggestion which I think will make it clear to you that you have a right to describe that child as having passed a crucial point in his intellectual development. Now go back to the school and you find that every intelligent teacher begins to realize that somewhere in the middle of the school, in the fourth and fifth grade, you must have a different method of teaching. You must have a new method of dealing with these children.

In the fourth grade it is no longer true of the child that he gives attention to the sensory materials offered by the page to his eye. It is no longer true of him that he must devote his attention to the mere mechanics of reading, because at that point the child has a mature habit of perception. We find him ambitious to use what he has cultivated and we ought to give him an opportunity to do it. We ought to change our methods sharply, clearly, definitely, and then we shall have a scientific mode of procedure in our schools that will correspond to the laboratory experiment.

Such adjustments will make us scientific because we are at once practical and thoughtful. We shall have no antagonism between these two types of investigation. We shall not have a practical school man saying to the laboratory investigator, "Your researches are remote. They are described in language which we can not read." We shall have, on the contrary, eager inquiry from the teacher as to the period when this change takes place. We shall hear eager inquiry for some detailed description of the kind of change which has taken place, for a description which will illuminate and make clear this experience that all along has been vaguely apprehended by our practical educators. At the same time we shall bring it to pass that the laboratory man is investigating not because he has come on some interesting phase of human nature, not because he is satisfying his own curiosity and his own demand for a problem that he can work out as a part of a remote and distant science; but we shall see the laboratory man coming over into the school and realizing with enthusiasm that human experience has been accumulating in the school which is of importance in defining his problems.

I have used the illustration of reading, I have referred to handwriting, may I use briefly in closing one other illustration? We have been trying in recent years tests in arithmetic. We have been finding great differences as the most characteristic results of all of our tests.

One of my good freinds, Mr. Uhl of Northwestern University, has recently added to the type of work which we are carrying on in these tests a kind of investigation that seems to me to promise very much. He has made an intensive study of the children who are unable to solve some of the problems. With the keen insight of the scientist he has gone with such a child to a quiet place where the scientist and child together can work out their problem. He has watched the child as the child succeeds in solving some of the easy problems. He has noted when the child begins to have difficulty and when the child has difficulty with a particular combination he has made that the subject of his study. What does he find? You give such a child the problem nine plus five, and find as your first superficial result that the child is slow in solving that problem. Often the teacher concludes we must give him some more drill in solving that problem, so the teacher says to the child, "Nine and five, how much is that?" He tells you by and by the answer. Then you try him again and he tells you the answer, but you know, if you keep a scientific record, that he does not improve. Why not? If you bore a little way into that child's consciousness, this is what you will find out. He is saying to himself, "Nine plus five; that is too complicated. I am not going to be able to deal with that. Let me see; five has a two in it and another two in it and a one; nine plus two, plus two, plus one is fourteen." As soon as Mr. Uhl puts us on the track of such facts as these we have a new view of the case. When you try to get that child to drill himself, he drills himself more and more with the two and the two and one and if you sit blindly by and simply drive that child to do it again you will build up a habit that will become so fixed that by and by when the child faces a five he will always try to analyze it. The child may think this is perfectly rational. Perhaps some good teacher did it once; perhaps some good teacher said to this child, "Break up a five into a four and a one and you can add a one to nine and get ten, then you can get fourteen." The child says to himself, "I will do a little more of it." So instead of breaking up nine plus five into a nine and a one and a four the child has added, if you please, two two's to make the four still more picturesque than the teacher thought of making it. Mr. Uhl reports a child who had a most astonishing method of subtracting nine from forty-six. I doubt whether you could imagine a more complicated method if you tried to devise some curious intellectual byway of doing this work. The problem was nine to be subtracted from forty-six. The pupil said to himself, "I take away one from the forty-six and then I shall have five times nine, then I get rid of one of those, and four times nine is thirty-six, but remember I have to add one in order to keep the equilibrium."

I believe that for a long time to come we shall have to have some one with keen scientific insight sit down beside that child and go thru life's intellectual complexities with him and leave behind a record which the child himself is not competent to leave. It happens now and then that he can tell us what his difficulty is, but more often he will be following some devious path in his effort to solve intellectual problems and will be utterly unable to tell us about it. It is our business to devise the method that shall make it possible for us to understand and describe what that child is doing even when he cannot tell us what the difficulties are.

This type of difficulty has undoubtedly existed in every schoolroom where arithmetic has been taught, since the day that the three r's came to be the foundation of our education. Unnecessary analysis has been going along with counting on the fingers, but we have been able to see the counting on the fingers while we have had no refinement of scientific method such that we could observe in detail what goes on where the fingers do not appear and manifest themselves to us without scientific method. The scientist will have to contribute to practical experience in order to elucidate what practical experience has contained, but has not been able to see.

We must use in all fields of human endeavor the best methods that we can employ to look into the intricacies of life and then we must frame our method of procedure in the light of these revelations. Experiment in education means the development of those methods that shall make it possible for us to see what is going on in pupils' minds, and having seen what is going on to try this method and that method of meeting the situation until we shall arrive at solutions that will make the pupils more efficient. We must have measurement in order to understand where we are. We must have analysis in order to understand the processes with which we deal. We must have experiment in the classroom in order to devise methods of improving conditions and we must follow the new methods with new measurements which shall determine how far we have made progress beyond the point of our beginning. When we are thus scientific, when we bring to bear upon our practical problems every scientific device that we can develop, then there will be no breach between the laboratory investigator and the practical teacher, but there will be one common cause and one common interest, because our educational work will be established on sound scientific principles applicable in practical life.

Round Table: Reading

Led by C. H. JUDD

I DO not know what the difference is between a round table and the other performances, unless, as your chairman suggested, you have some questions to ask.

VOICE: I am very much interested in one question that you brought up yesterday. It is apparent from the figures before us that we in the first three grades are giving too much attention to oral reading. I think the figures prove it. You proved your case all right, but we are not doing in the first three grades what we should do along the line of silent reading. I wish you would amplify that subject and show us what we might do to better that condition. The historic work done in Brooklyn, Kansas City, Cleveland, and other places in proving the method of teaching reading, beginning back in the years when Ward was in the work, has led to this condition of excellent oral reading in these cities, and a lot of other cities that have followed in that study. Oral reading is far superior to what was done before on that side, but these figures indicate that oral reading work has been carried so far that it appears to be formal and contemplative, or silent reading has not been developed in those three grades. You made that point very clearly yesterday, but I should enjoy very much, and I think others would, to hear the remedy discussed.

MR. JUDD: Now, I think the problem before us can be approached by asking one general question, Why do children come to school only after they have reached the age of five or six? That is true all over the world. What does it mean? I think the answer is this: A child can come to school only after he has acquired enough language so that he can be relatively independent in society. Prior to that time the family has to look out for the youngster and see what his needs are. The child has not enough language to go to an institution. He cannot express himself, and he cannot understand what is said to him. The child is ready to come to school at five or six years of age when he acquires a stock of oral language. When in the first grade we begin to teach him reading, a new form of language which he does not acquire, naturally, in the home environment, we must begin with the oral language that he brings. All the training we give in the first years must attach directly to that which the child contributes. He brings oral language with him, and since we want to teach him this other form of language, we must take advantage of that which he brings.

In the early years we are working to bring together the written symbols and the oral language that the child contributes, and there must be a certain emphasis on the mechanical process of bringing together the printed symbol and the child's oral language. We have had a good deal of difficulty in deciding the units in which we shall do it. The great advance made by the Ward method, to which you have referred, was that the Ward method said, "The unit that will help us to bring together the child's oral language and the written symbol is not the letter." Obviously, the oral language that the child brings has never been broken up into letters. The language which the child is to acquire may ultimately be broken up into letters, but that is not the natural division. The natural division, as we print words now, is a word; consequently the Ward method made a great advance in teaching the child a word as a picture, and relating it directly to the oral word, which is of course the unit. The Chinese have done that from the beginning. They have a picture for every word, and they have never tried to make an analysis in the written symbol, beyond the point to which it has been carried by the oral speech. The Chinese draws the picture of a word; the relation is perfectly simple. The word method failed at first because it did not recognize the fact that ultimately the children, in order to learn to spell, must analyze written symbols into letters. Teachers found in the early days of the word method, when they did not pay any attention to the analysis of the words, that children who had reached the fourth and fifth grade could not spell. They accordingly adopted a modification of the word method which makes a phonetic analysis of these words, that does not break the word up, first of all into letters, but breaks the word up into certain familiar sounds: it, bit, sit, knit, all that sort of thing. It is a unitary sound; that is an effort to take the sound analysis which is easily related to a letter combination.

The mechanics of relating sounds and written letters is so absorbing to a great many teachers that they spend a great deal of time with children in phonics, drilling them and getting the combination between sound and letters fixed. They fail to realize that there is a new problem the moment one goes beyond the child's oral speech. It is all right when you are teaching a child in terms of primary grades, merely to rely on what he brought with him in oral speech. In the primary grades it is a matter of relating letters and sounds, and not a question of giving him new information, not a question of using this reading matter for the purpose of intellectually going beyond what the child can bring, and does bring from home.

Very shortly, however, your reading matter begins to extend beyond the child's experience. Now, you have an entirely new problem; it is the problem of teaching meaning. This problem must be taken up with care. Gray found in St. Louis that they were going more slowly with their reading in the lower grades, but laying great emphasis on accuracy and recognition of meaning, while in Cleveland they are absorbed in going as fast as they can, without paying attention to meaning. I am going to venture, if I may, to call on Mr. Gray. He came down here to see what you are doing in Indiana, but you ought to see what he does about these things, too. Won't you tell them about that difference between the methods in St. Louis and Cleveland?

MR. GRAY: It is just a little difficult to try to make a table clear, when one has not the figures before him and will be speaking more or less in the abstract, but those of you who gave the oral reading test will remember that two sets of facts were recorded in regard to the reading, in each paragraph, namely, the number of seconds required to read, and the number of errors. We have summarized for St. Louis and for Cleveland the average number of seconds required to read the paragraphs.

Let us take, for concreteness, Paragraph 1. "A boy had a dog; the dog ran into the woods," etc. There were about fifty words in that paragraph. I cannot give you the exact number of seconds required by the two schools, but beginning in the first grade Cleveland made a record in speed which was distinctly superior to the record made by St. Louis in speed, and as you follow the grades, from the first to the eighth, successively, you will find that this superiority in speed is maintained thruout the city system on the part of Cleveland.

On the other hand, when you summarize the errors which were made you will find that St. Louis is as distinctly superior to Cleveland in accuracy as Cleveland was superior to St. Louis in speed. Now, I think we may summarize that by saying that teachers consciously or unconsciously emphasize this or that phase of instruction. City systems do the same thing, and, as far as these two qualities are concerned, you can see that St. Louis was giving more specific attention to the accuracy and content side of the material rather than to the more formal element, namely, speed.

I would not underestimate the importance of speed, because it is highly essential in securing speed or facility in silent reading, but to the extent that that mechanical phase of the work is emphasized or overemphasized, it becomes a detrimental factor, of course, in the progress of the work.

MR. JUDD: That is the point. There is a body of very interesting empirical evidence to show that if you give your attention primarily in the lower grades to accuracy, detailed recognition of the words, and the securing of the meaning, you are laying a substantial foundation for later reading. Witness what comes ultimately in St. Louis; they are distinctly ahead in the lower grades. There is a temptation to get up fluency of oral reading, and to give your whole attention to that. If you will check that a bit you will ultimately get all the speed you want, as witness again St. Louis. You get all the speed you want, and also the other very desirable characteristic, and I think Mr. Gray's point is much to be emphasized.

If you go into a city with a system of reading which is primarily a phonic system, you commonly find that teachers are emphasizing the ability of the children to pronounce words and read fluently, whereas it would be better if these teachers recognized that the main thing is to teach these children to read for meaning. We must have the fluency; we must get pupils to analyze their words, but we must have accuracy and interpretation.

One must begin with oral reading in the lower grades, gradually emerging from that in the fourth grade, taking up at this level a great deal of accurate, meaningful, silent reading. Then I should gradually drop off the amount of oral reading in the upper grades, say the fifth and sixth, reducing it greatly in amount, not spending five times a week on an oral reading exercise, but utilizing some of those oral reading exercises as opportunities for silent reading. Children learn to be rapid readers silently only when you give them an opportunity to do it, and I think the fallacy in our present procedure in reading is that we make reading an exercise where it is always oral reading, and always a kind of public ceremony, whereas we ought to offer the pupils an opportunity for silent, meaningful reading.

In the seventh and eighth grades I shall let the children bring in some exercises that they are interested in reading to the class. I should not have all of the books uniform thruout the class, but I should let the children come in with material that they want to present; that is, a real oral reading exercise.

VOICE: Could not that material be introduced earlier than the seventh grade?

MR. JUDD: By the time you get to the seventh grade, I would not have anything else, if you please. Down in the fifth grade, I think it is entirely proper to have all the children with books in hand, reading some of this material, and perhaps criticizing each other in the reading of the material.

I saw an excellent piece of work in the matter of oral work in a high school near Chicago. The teachers picked out all the children who were failing in the first year in that high school, Cicero High School, and they said, "These children are failing primarily because they do not know how to express themselves," so they grouped them together into one class to emphasize English. In this class each child had a set of cards with a full list of the class. Each member was given some theme on vocational opportunities for boys. These themes were presented to the class. Every time a child got up to recite all the members of the class took out their cards and if he stumbled or looked up at the ceiling or looked out of the window or hesitated, they wrote a note and said, "Johnny does not do his work well because—" and they put down the reason. This came to be a record of why each child was not doing his work well. But much more than that, when the boy who wrote the criticism got up he remembered he must not do those things for which he had criticized his fellow-members. Toward the end of the year when I saw them they sounded like an ordinary group of children reciting extraordinarily well; they had been saved by being given an opportunity to criticize each other.

I should say in every sixth grade you ought to have some opportunity to let a child stand before a class and read, then the class ought to have an opportunity to say, "I couldn't hear," or, "I think that could have been done thus and so." They will thus become intelligent by making comparisons between members of the class. They will do this very well if the material is new and interesting, brought in by the pupils as suggested above. The ordinary sixth grade reading exercise is one of the most solemn failures that you can possibly face, every child with the same material before him and nobody caring anything about it, nobody criticizing anybody else, simply proceeding thru this ordinary routine. It is not a reading exercise and nothing except a bore to everyone concerned. If you are going to have oral reading let it be genuine oral reading, for the purpose of criticism or conveying information, but emphasize a great deal more methods of accurate silent reading meanings in these upper grades.

MR. BLACK: Do you think that the relative amount of oral reading in the lowest grades, say first, second, and third, is too great?

MR. JUDD: I think probably not. The oral method is the only possible method there. There might be more attention to the beginnings of silent reading. If you will analyze a primer you will make up your mind exactly why it is written as it is. There has to go on the first page something familiar to every child who takes it up, because on the first page the child cannot get any information. You will find the first page of a primer presupposes the ability on the part of every child to pronounce every word that is there. The trick is to show him that he does know, and he must see this word, and then he must relate it to something already prepared. The first page of a primer aims to relate known forms of experience, known forms of articulation with unknown written symbols.

I am in favor of the teacher recognizing that fact and making her own primer. Some of the best primary reading I have ever seen the children and teachers prepared when they came in from the garden, or something else, and the children, knowing what they want to say, will have the matter written on the board by the teacher. I have seen that multigraphed. That should, it seems to me, become a common thing. I should make a book for the children. I think you can make the best primer that can possibly be made, and then it will be meaningful, and then the children will get hold of the idea, and reading and meaning all go together. Oral reading of this type seems to me most appropriate for the early grades.

The teacher must pass now to another kind of reading, reading for new experience. This, too, should at first be done in a coöperative way. The teacher should say, "Here is a book about something we haven't seen; here is something that tells you about people living in Greenland or the people who live in Africa; we can't see them but you can find it here in the book." By and by you will find the reading naturally glides over into the silent informational type, provided you have utilized the social opportunity provided by oral reading to the limit. I think we should make reading a genuine, practical concern, directly connected with the ordinary experience, so I should be willing to say, Professor Black, that if you will utilize reading for meaning in spheres where children are prepared to apprehend the meaning you can very readily get a body of material that may emphasize meaning without having to go out of your way to do it, because you will get the mechanical work done in the early grade and by and by you can transfer that directly into the field where you want to get the meaning without having to emphasize the mechanical side of the process.

MR. BLACK: Where would you begin to decrease the amount of oral reading?

MR. JUDD: Third grade; I am perfectly clear on that. The third grade in the ordinary school is a place where a child has learned to read enough so that he can be intellectually aggressive, and by the time he gets into the fourth grade I am perfectly certain that he ought to be doing a very large amount of reading by himself. At first he ought to be guided by the teacher in the methods of silent reading.

The third and the fourth grades are the periods of transition. I think the reason why the fourth grade is the point where children begin to do something different from that which they have done in the primary is that during the three years the child has been learning how to read, and now he is relatively independent when he comes into the fourth grade. What does that mean? In terms of my discussion last night this means that the perceptual unit gets larger and larger with the result that in the fourth grade a child runs rapidly along with his eye and attention while his vocal cords are struggling along behind. As a result he will stumble in his oral reading. Whenever your attention is ahead of your performance your performance will begin to be bad; consequently in the fourth grade many children seem to be stumbling in their oral reading just because they have learned to get far ahead of the vocal apparatus. The ordinary teacher will say to such a child, "You are stumbling in your oral reading; therefore you must stay in the fourth grade and learn to read orally," when the real fact of the case is that the pupil is stumbling in his oral reading because attention is running ahead of the oral performance.

It is perfectly obvious to me that the child ought to have an opportunity to go ahead and read silently. If we are going to have this oral reading in those upper grades, fourth, fifth, and sixth, and so on, it ought not to be for the purpose of interfering with the child's reading, but purely for the purpose of expressing ideas to other people. We do not read orally for the sake of getting the meaning; we read orally sometimes for the sake of social comparisons of interpretations.

You can have children study geography lessons orally. You get them to read over the geography and you can bring out fine shades of meaning. Will you allow me to tell a personal experience which was very impressive to me? I remember when I was a college student, Professor Winchester, my teacher in English, asked me one day to read from *Hamlet*. I am sorry I cannot give you the exact quotation, but after Hamlet had seen the ghost, and the ghost says, "Remember me," Hamlet wants to tell him he will. Hamlet's answer has in it two lines which begin with "Remember thee." "Yes," he says, "I will remember thee after all my other faculties are gone." "Remember thee." "Why, I will remember you after I have forgotten everything else." Now, those two phrases look exactly the same in the printed matter, "Remember thee." "Yes, so long as I have any faculties I will remember thee. I will remember thee as long as I remember anything."

I did not see the different meaning; I said, "Remember thee; certainly I will do that." Winchester said to me, "Are those 'Remember thee's' just alike?" I looked with an entirely new view on that passage. I think that was good oral reading for a college class. It checked up what I had not done. I had not got that meaning. When it was over I knew I did not have that shade of meaning.

Once in a while I think you have to have an oral exercise to bring out values for the child, to give him the opportunity for interpretation. Oral reading in the upper grades is not for the sake of teaching me to read. I could read, but I could not interpret the oral reading exercise.

I do not think we ought to have the interpretation exercise confined to one hour a day. I think we ought to have interpretation and, if necessary, a little oral reading to bring out interpretation in the geography class or history or in anything, but the purpose of such oral reading as we have in the upper grades ought to be to supplement interpretation, not to work out mechanics of reading.

May I add this further comment? If instruction in the mechanics of reading is not over in the third grade you are in trouble because when you get a sixth grade child who does not have the mechanics of reading, you have a serious problem because that child will not give attention to the mechanics of reading. The little child down in the lower grades does, he is anxious to imitate the teacher, and he is extraordinarily social. The fifth grade boy is not so social. The sixth grade boy is not social at all; he is not docile at all, and if he cannot read now it is very unlikely that you will be able to get from him that kind of laborious imitation which a little child is always willing to contribute, as the background and foundation of reading. You cannot get imitation in the sixth grade if you do not have it in the lower grades. I think we ought to lay a great deal of stress on getting the mechanics of reading in the lower grades where the children are able and willing to do it, and then in the upper grades we ought to make use of that material and not be trying to get it in its primitive form.

VOICE: In what grade should lip reading be eliminated?

MR. JUDD: Lip reading is characteristic of slow readers. Clumsy, ineffective readers always have an excess of oral performance going on. Perhaps you have seen someone who cannot write trying to compose a letter. I remember very distinctly helping a friend of mine who is a gardener to write a letter. He wanted to write the letter and all I was to do was to help him, and I remember seeing that chap sweat over a letter as I should have sweat over spading his garden.

Writing a letter is a colossal performance. If you have not done it for some years and do not know the mechanism you can get up just as much friction doing that sort of thing as you can doing any genuine piece of work. The same sort of thing appears in reading. If you take a person who is utterly untrained in reading and he has to get something off the page, you will see him set all the machinery he has in motion to extract that meaning from the page.

Once in a while I sit opposite some man on the suburban train who feels it necessary to get a piece of information out of a newspaper, and it is really worth the price of admission to ride down with him and see him go thru that operation. He is absolutely absorbed in this paper, working it over with all of the motions that he can possibly put into his lips, sometimes even reading out loud.

The person who cannot read well will overwork; the person who has not learned to read will show much vocalization. Where I find a child who has a great deal of it, and some of them have it even in the high school, I regard it as a symptom of bad reading.

VOICE: In order to overcome that symptom, when should a conscious effort be made to eliminate lip reading?

MR. JUDD: I come back to my general formula: Wherever you find it, it is a symptom of incomplete reading. You have to find it in the first grade, because that is the only kind of reading of which the first grade is capable. I should expect a little less in the second; in the third grade, it ought pretty largely to disappear, if the training has been right. In the fourth grade, I should be anxious; in the upper grades I should regard it as a positive defect.

Oral reading is entirely appropriate in the first grade, but diminish it in the second grade. In the third grade it is reasonable to expect a little of it, but you ought to begin to be anxious in the fourth grade. That comes back again to the general formula. You ought to get a child in such a condition so far as reading is concerned in the third grade so that he can attempt any reasonably interesting material without excessive facial and vocal cord movement.

In the experimental laboratory we find that no one is entirely free from traces of vocalization. If you put a little rubber bulb in your mouth between your tongue and the roof of your mouth and carry off that tube to a recording apparatus, you can see how unstable your tongue is. If you begin to think intently you get a more active record. If you begin to read you will get some excitement shown by the involuntary movement from your tongue; if you try to read French or German you get a good deal of excitement. When you are thinking fluently and smoothly and working in a field where you are thoroly trained, you get very little movement. The more you get rid of that movement the better. If you are working in a field where you are less and less and less expert, you will get more and more movement. There is almost complete parallelism between the two.

Practical Results Obtained Thru the Use of Standardized Tests in School Achievement

C. H. Judd

THERE are three types of activity that I think we have to carry out if we are going to make measurement of school results effective. First, we have to persuade the teachers that they need to do it. I am not at all sure that we have laid enough emphasis on that part of it, so I have put a few diagrams on the blackboard that I think could be used and have been used in some quarters in the effort to persuade teachers that they ought to measure something. To these I shall return in a moment.

The second part of the program is to make the measurements. Someone has called it the diagnosis of the situation. Finally, I think we are agreed at this conference that there is a third part of the program, which is to go out and use the results of the measurements as a means of doing better. I am going to deal more especially with the first part of the program because I do not think we have talked about it very much. I am going to try to show how we can collect evidence which will make it clear to teachers that they ought to make these measurements. I have put down here the tables. In the city of Cleveland 17 per cent of the children in the first grade fail of promotion. The reason why I would like to begin with this sort of a fact is that the teachers made that fact. The teachers recorded that fact, they recorded that judgment of their own work. You do not have to make any new measurements, you say to the teachers that according to their records, 17 per cent of the children in the first grade in the city of Cleveland fail of promotion, which means that in the minds of the teachers of that city something has gone wrong with 17 per cent of the children.

I am not blaming the teachers at all, mark you. Perhaps that which has gone wrong went wrong before the children came into the first grade. Very frequently it does. The fact without explanation is that something went wrong with 17 per cent of the children in the first grade. In the second grade 12 per cent of the children fail of promotion. That is a better situation than the one in the first grade, and the teachers know it and the teachers have recorded that the situation is better. It is a perfectly natural expectation on the part of anyone who investigates this matter that he will get further improvement as the grades go forward.

If 17 per cent fail in the first grade those who get into the second grade ought to be better adjusted to their work and apparently they are, so we have a failure of only 12 per cent. Now, the astonishing fact in the city of Cleveland is that when you get to the third grade a larger percentage of children fail than in the second grade and when you get to the fourth and fifth grades a larger percentage fail than in the third grade. The figures are 14 per cent, 15 per cent, and 18 per cent. That is what teachers said about it.

You do not have to import any test or outside measurements. Certainly something has gone wrong when the children who are attending school in the third grade fail to the extent of 14 per cent which is in excess of the percentage failing in the second grade. When that percentage steadily increases up to the fifth grade you do not have to debate it very much with the teacher that there is something to investigate.

I believe if you would try in all the schools of this state to tabulate the judgments made by the teachers you would get something that would furnish an excellent basis for any one of these studies. The teachers of Cleveland had not been made aware of these facts. To be sure they were in the annual report printed year after year, but they were printed in a fashion that did not bring out their meaning. What was printed in the report was the aggregate number of children who fail in the first grade, the aggregate number who fail in the second, and so on, and no one noticed the fact that the percentage of nonpromotions was increasing in successive grades. The simple device of putting their own results to them in a form that made comparison easy brought to their attention the situation which they had neglected to observe.

You might follow the table beyond the fifth grade, where things begin to improve a little, but not very much. In the sixth grade it is 17 per cent, in the seventh grade 16 per cent. You see on closer study that the apparent improvement does not amount to very much because there begins to be a heavy elimination in the fifth grade. The children who are not getting on well disappear and when you have here 17 per cent in the sixth grade, it is in reality a bad figure.

It happens that in the city of Cleveland we had a very good opportunity to carry this investigation one step further, because in that city they had kept very careful records of a variety of different sorts and they had especially a record of failures in particular subjects. So we have a record of the failures in reading, 14 per cent of the children fail in the first grade in reading. This is practically the same number that fail of promotion. In the second grade only 10 per cent fail in reading. This is a great improvement; indeed, it is a little more than the improvement which we see in nonpromotion.

Continuing the reading record, we see that in reading they are satisfied with the work which they do in the third grade, for only 6 per cent fail; in the fourth grade, only 4 per cent, and so on. All this shows great satisfaction on the part of the teachers with the work done in reading. Reading goes all right. The children who are going to have difficulty are eliminated in the first, second, and third grades, and from that time on there is very little difficulty.

The Cleveland survey shows that the satisfaction on the part of the teachers was not well founded, because as a matter of fact while they were getting on very well with the formal reading, they were doing very badly so far as comprehension was concerned. But without disputing about reading you can go to these teachers and say there is something wrong with nonpromotion. Your reading seems to be all right, but is there justification for your assumption that your reading is all right? Notice your reading does not agree at all with your nonpromotion tables. If you say in nonpromotion, as you do, that the children are stupid and ought not to be promoted, and say in your reading table that the children are all right, they can read, you have something to explain.

That is a little longer form of the argument, you see. You cannot go at first to those people and criticize their reading; you have to say to them that they show satisfaction with their reading, but that satisfaction with the reading does not agree with their dissatisfaction as shown in the nonpromotion tables. The discrepancy was brought out in an impressive way in the case of the Cleveland report, because the teachers had been committed by an ancient practice not only to reporting nonpromotions, but to the reporting of the causes for nonpromotion, and they had set down solemnly why their children were not promoted into second, third, fourth, and fifth grades, and the reason that they had set down was "mental incapacity".

Mental incapacity is a fine omnibus phrase. If you do not want a child to pass in a school and need a phrase with which to explain it to the parent, you call the parent in and use such a phrase as mental incapacity and the parent goes home either satisfied or dissatisfied, but he is not likely to continue the argument. You have, if you are a student of schools, the interesting fact that children who are nonpromoted for mental incapacity are an expense to the city of Cleveland because they had to do that work over; they certainly were bored by doing the work over, and not likely to get much out of it. Here was the grim humor of the situation; the teachers were calling a lot of children incapacitated individuals on the mental side and yet were promoting them so far as reading was concerned.

I say it is a little longer argument, but after you have carried the argument out there are very few persons competent to teach in schools who will not see that there is something to be investigated when the nonpromotion table says one thing and the reading table says another.

In Cleveland we can go a step further. They had recorded as I remarked the percentage of failures in all of the other subjects. I have only one other here on the blackboard and that is arithmetic. In arithmetic no one failed in the first grade, they do not have very much; very few children fail in the second grade, again they do not have very much. Twelve per cent fail in the third grade, where it is beginning to be a serious issue; 14 per cent fail in the fourth grade, 17 per cent fail in the fifth grade. There must be something wrong about arithmetic or else with these children, but we have evidence that the children are all right, because they can learn to read. We have a background now for a determination of what is wrong.

It is not the children in this case. Anyone who can read and continue to read grade after grade and do it very well cannot be regarded as seriously intellectually defective, so that when you find that your arithmetic is getting to be so steep a hill intellectually that these children cannot climb it, either arithmetic is very well taught and reading is badly done or reading is well taught and arithmetic is badly done, and you can take your choice. Perhaps arithmetic is right, in which case reading must be wrong, because these children are certainly not being handled in the same fashion in reading and arithmetic. Furthermore, the arithmetic failures are a very impressive fact, because they look very much like the nonpromotion table in general.

The point I am trying to make, please remember, is that you can persuade teachers that there is something to investigate if you will take their own returns and put them together. I never knew it to fail. Make a tabulation of the teachers' records and you can deliver to them the foundation for any investigation you want to undertake.

I have put on the board one other set of facts. Here is a diagram from the city of Grand Rapids, worked out in exactly the same way. The nonpromotion curve for Grand Rapids begins very much like the Cleveland curve. It is up here in the first grade, drops considerably in the second grade, but from here on it drops below 10 per cent in the third grade, then oscillates around 10 per cent with some advantage in the upper grades. That is a great improvement over the Cleveland situation. In the main you can say that in Grand Rapids they do not fail to promote their children to anything like the degree exhibited in the Cleveland returns. But now here is a very interesting fact. Their reading curve looks very much like the Cleveland reading curve, in fact, it is almost identically the same kind of a situation, and the further interesting fact is that their arithmetic curve looks just like the Cleveland arithmetic curve, in fact, it is a little worse than the Cleveland arithmetic curve. What is one to say about things of that sort? I will give you the answer.

Get the problem clearly in mind. You have two great municipalities, handling children by the thousands. In one case reading is regarded as satisfactory. In the other case reading is regarded as satisfactory. In one case arithmetic is regarded as unsatisfactory. In the judgment of the teachers of the other case arithmetic is equally unsatisfactory, but one municipality promotes its children so that they have an average of about 4½ per cent better promotion than they have in the other municipality. You see that means a matter of a good deal of importance to some children, because that means a year of schooling. To the city of Grand Rapids the gross results are enormously important as a mere matter of financial economy. Grand Rapids is ahead of the gross results in the city of Cleveland. The reason Grand Rapids is better in nonpromotions while the same in reading and arithmetic is that they have an administrative device in Grand Rapids that covers all their sins. They have trial promotion. If they encounter difficulty with a child in arithmetic in Grand Rapids, instead of keeping him back as they do faithfully and consistently in Cleveland, they say, "O, well, let him have a trial," and the interesting fact is that he succeeds with the trial. Do you see what they have done by an administrative device? They have covered up a course in arithmetic which evidently needed correction. The Grand Rapids course needs correction just as much as the course in Cleveland needed correction.

I have been trying to show you that you can get teachers to understand that there are problems to be worked out only when you lay before them their own results, and by a comparison of their own results make it perfectly clear to them that there is a problem to be studied.

Studies of this type are very useful in aiding administration. I know a young high school principal who went to a high school that was perfectly satisfied with itself. Perhaps some of you have encountered institutions of that sort. The faculty was entirely satisfied that it was one of the best faculties in the United States. If that young principal going to that high school had canvassed the various recitations and had called one after another of these teachers into his office and said, "You are a very bad teacher," you know what would have happened to that principal. He was young; he was light-hearted; he went into that job not realizing what an encrusted high school faculty he was going to encounter. What did he do? He did not argue with the individual teachers. He went and got the statistics in the neighboring university for a period of four years of the work done by the graduates of that institution. That was not all he did. He got the similar statistics from three of the rival high schools and what came out was really amusing. The Lord was with him in that matter and delivered the Israelites into his hands. He made a comparison of the record of his school with those of the three hated rivals. He hung the tables on the board for faculty meeting, that was all. There was no argument between that young principal and that faculty. He said, "Ladies and gentlemen, I have been very much interested in the work done by this school. I regret to point out that our neighboring schools which are so inferior to us in point of equipment of the faculty have made a record so superior to ours. Perhaps there are items we can consider at subsequent faculty meetings. I will leave the charts here. The faculty is adjourned."

Again I come back to my point. You must convince your teachers that you have something to discuss with them. You cannot profitably begin the discussion until you have created that preliminary conviction that you have a right to debate the matter. Twenty-four months ago, you could not have had a debate with Cleveland about its reading. Today it is almost literally true that you can meet any man on the street and have a debate with him about school matters. The people are all convinced that something ought to be done. They see the necessity of doing something because their own records show that necessity. The survey did not merely find out something by methods of measurement imposed by scientific students; it made an effort first and always to bring it about that the people should be convinced by the fact that their own records showed that something was not going well in that school system. This then is the first chapter of any reform. Persuade your teachers by means of various records. The second chapter about making the measurements is familiar. I am therefore going to close with an outline of the third chapter.

The measurements which we make are useless if they cannot be applied to class work. Too often measuring tests are looked on as ends in themselves. They are not ends. If they show that reading is not well done, the insistent question which teachers have a right to ask is, What are we to do to correct the defects? Our inquiries must go on so as to bring new suggestions which will help the teacher.

Some of the steps of this further movement I have tried to point out in my earlier talks. May I go further and tell you some of the possibilities which I believe the future holds?

I am going to give you a few of our ambitions, if you please, rather than actual achievements. I look forward to the time when we shall have a clinical description of educational difficulties, analogous to the clinical descriptions that we have in medicine.

If you study medicine you will find that doctors will tell you typhoid is so and so and they give you some of the general outlines of typhoid, but they will also say to you, "Don't make the mistake of thinking typhoid is the same thing every time you come in contact with it." Typhoid has many forms. Every patient who has typhoid is a unique subject of scientific investigation; there is a type of typhoid which is thus and so; there is a type of typhoid number two which is thus and so; there is a type of typhoid which is number three. We will give you the clinical description of number one and number two and number three and number four and you must learn not to treat typhoid all alike, because there is a difference which justifies our clinical description of number two as distinguished from number one. Your treatment must recognize that same distinction. Some day, I am sure, we shall see bad reading classified in our educational files exactly as the doctors classify typhoid.

Today we cannot do it as fully as the doctors do it with typhoid, but I can give you two or three brilliant illustrations of clinical descriptions. I know three children who never learned to read until they were thru the first, second, and the first half of the third grade. They were not imbeciles and everyone in contact with them was very much confused about those children, because they seemed to be perfectly normal children, in fact, they did the work in arithmetic that was taken up in those lower grades but they could not learn to read. You can find like cases written down in the literature of pathology; you will find that the neurologists have described children who at first cannot learn to read but later undergo a sudden cure.

Do you know what the explanation of some of those cases is? It lies in the fact that a bright child arriving in the first grade, full of new interest, distracted by the richness of all the new experiences that are around him, refuses to bother with little black marks on a white page. He does not see why a human being should pay any attention to those things. The teacher cannot get his attention for reading at all; he is not interested in it. You try to say to him, "Read this thing," and he is more interested in something else and he will proceed to do it. When such a case comes into the hands of a teacher who is responsible for thirty, forty, or forty-five children in the second grade and the first grade, it is neglected. If such a pupil wants something out of a book there are many persons around to tell him what was in it. Children of this type are interested in a story, but when they were asked to participate in the difficult problem of producing the story it seemed to them to be a work of supererogation and they refused to learn. The cases which I know were about to be adjudged defectives by the city department of child study, but they had the great good fortune, because they were about to be classified in that way, to fall into the hands of a very skillful teacher who looked them over and said, "If I could interest the children in r's and a's and b's and c's, maybe they would learn to read." So she said to them, "Children, let's draw some pictures, let's make a picture of a man." She drew a round circle and put two legs at the bottom. She did not go any further. "This is a man and he can run. See whether you can find him on this page anywhere." They found a capital R. Soon she had the children looking everywhere for capital R's and after all if you want to approach the matter in that way R's do look like the head of a man and two legs running around. Perhaps you never thought of doing it in that far-fetched way, but that skillful teacher found the device effective in showing these children that there is something interesting on a page. She did not say to them, "Your future depends on your ability to extract information from this page." She said to those children, "See whether you can find one of these chaps running around." Then she said, "Did you ever see a ball that you can roll? It is here. I will put it on the blackboard, a round ball. See whether you can find some on the page." The children found any number of round balls rolling around the page.

One of those children, described by a long pathological term of neurology as suffering from developmental alexia, learned to read in three weeks. Of course, he had had some of the necessary preparation for reading, he had been maturing in a place where reading was going on, he had all of the information necessary for interpretation, but he refused up to that time to bother with these little black things on a page.

I have given you three extreme cases, but there are hosts of children who are half unwilling to pay attention. There are a great many children who are only partially impressed by the example of the schoolroom and the example of society. We assume in the school that the children are eager to read; we assume that they are going to have the foresight to look into the future and understand the value of reading. But this is assuming too much. There are some children lively, distracted, perfectly normal children, who do not take on this habit in the early years, and you have to devise very frequently special methods for them, perhaps not as artificial as the ones I have described, but you have to describe reading to such children in terms that will appeal to some trivial momentary interest.

Do you realize how artificial reading and writing really are? If you do not realize it hunt up sometime the archives and see what writing was in the Elizabethan period. That is not so long ago historically, but the clumsy, ugly, uncoördinated forms of letters written only by the aristocracy in those days will leave in your mind the very firm conviction that reading and writing are relatively very new arts, and that the world's history has been made in a very large measure by people who did not regard it as worth their while to pay any great attention to this extraordinarily artificial kind of material that we offer the children on the printed page.

I have described one kind of a bad reader. I want to give you another kind of a bad reader, and I will keep the promise about that time of closing. This second type can be described by the technical phrase which I will use, if I may, as having "a very short span of attention". There are at least two distinct reasons why a person has a very short span of attention. I will give you an illustration or two. One often finds a girl in the high school, a conscientious, normal girl, who gets most of her lessons, but whose parents complain about home work; they say she finds it very arduous. The case of which I knew came to live with her uncle; the uncle became concerned because this child did not seem to be able to do the home work as other children did, and brought the child around and said, "I should like to know what is the matter with the child." We took some measurements. The child could not read at a rate that compared favorably with the reading in the fourth grade. Of course, the child was troubled with assignments. She could reason, she could understand ordinary words and ideas. So we put a special teacher at work with this child, not so much for the child's advantage in this particular case, as for the sake of our diagnosis; we wanted to find out what the difficulty was. We tried to speed up the child in reading. "But," said the girl, "if I read rapidly like that I shall not hear the words." Do you see what the difficulty with that girl was? She had been brought up to read orally every word that she read and her span of attention was limited to hearing and speaking each word. The trouble with that child was an overdose of oral reading.

The second reason for a short span of attention is that pupils do not know the words. The words look unfamiliar and the pupils stop to look at each letter. They make an elaborate visual analysis of words which they ought to recognize as wholes.

These few cases must serve my purpose. The treatment in each case must fit the special difficulty of the particular pupil. It would be as foolish to classify all these children together as poor readers as it would be for the physician to classify all sick people under one head and give them all the same treatment. In the schools as in medicine we need to learn to discriminate and classify. Then we shall fit the treatment to the difficulty and our scientific studies will issue in productive practice.

A Study in Arithmetic (Courtis Tests, Series B) in Indiana Cities

H. L. SMITH, Dean of the School of Education, Indiana University

AT each of the four annual conferences on Educational Measurements held at Indiana University (1914, 1915, 1916, and 1917) some emphasis has been placed upon the measurement of achievement in the fundamentals in arithmetic. From the very beginning the purpose back of these arithmetic discussions and studies has been twofold: first, that of finding out the actual conditions; secondly, that of determining methods of improving conditions not found to be satisfactory. The one purpose is that of exhibiting a picture. The other purpose is that of building, on the information contained in this picture, the scaffolding that will support improvement. It has been the purpose, too, in all these four years to correlate as nearly as possible the work of the conference held in the spring with the individual studies made, during the year, in a coöperative way with various school systems thruout the state. This year an effort has been made to effect a still closer correlation between these two activities. To this end we are reporting at this meeting summaries of studies that have been in progress during the year. These studies will be analyzed more in detail later on, but the large conclusions are available at the present time. A special effort has been made also this year to connect the two fundamental purposes of all these studies, namely, the purpose of revealing conditions and the purpose of remedying these conditions. To this end you will notice by the program that we have arranged for both Dr. Strayer and Dr. Judd, in at least one address each, to emphasize by concrete examples the beneficial results following the revelation of conditions by tests. Up to the present time emphasis has been laid primarily upon revealing conditions. This represents only the first step in what should be done. Unless the work goes farther than this, it will be of comparatively little value. The problem of the future is that of discovering just how to make conditions better. There is some value, of course, in simply blindly but stubbornly attacking the problem of improvement in the hope that some good results will ultimately be evolved. Only slight progress, however, can be made without accurately controlled experiments in different ways of improving the various phases of the arithmetic work. Those of you who have been attending these conferences in the past will remember that a few attempts have been made looking toward constructive work. Especially will those of you who have been reading the individual arithmetic studies published by Indiana University recall that Professor Melvin E. Haggerty in his 1915 study entitled "Arithmetic, a Coöperative Study in Educational Measurements", throws some light on the significance of the time spent on arithmetic, of the time of beginning arithmetic, and of the degree to which arithmetic teaching is supervised, in effecting achievement in this subject. In the 1916 publication there are two studies on the effects of drill: one by Miss Mary Kerr on the effects of drill in addition as carried on in the Bloomington schools; another by Mr. Herman Wimmer on a comparison of progress made with drill, and of progress made without drill in arithmetic. This experiment was carried on in the Bremen (Ind.) schools.

It was the hope to continue this type of study a little more elaborately this year [1916-17] and at the beginning of the fall general suggestions for investigation along this line were made in a bulletin setting forth the outline of work as contemplated for 1916-17. It was found impossible, however, to make the contemplated studies on the effect of drill in arithmetic, owing to the fact that because of the uncertainty in the paper market publishers could not guarantee the materials in time to make the study as planned.

The second purpose in the arithmetic study fòr this year was to continue previous studies of conditions in Indiana and to discover if possible the progress made since the beginning of these tests. The first part of this purpose has been realized. The second part was impossible of realization because of the fact that the cities that made the tests in the various years were not at all the same from year to year. Of the twenty cities that gave the test in 1914-15, only eight gave it in 1915-16; and of the twenty-two cities, that gave it in 1915-16, only three gave it in 1916-17. Only one city has continued the test in coöperation with this bureau for the three years. More of the cities that had given the test previously indicated their desire of repeating it this fall, but upon learning that the time of giving the test would have to be postponed on account of the inability of the publishers to furnish the tests when they were expected, they changed their plans. Other cities gave the tests and made use of the results independently of this bureau. The cities and towns included in this year's list, while larger in number, are much smaller in size than those included in each of the previous lists, so we have a picture of conditions in an altogether different type of school system this year from what we have had before.

In the year 1914-15 returns were obtained from only one city with a population under 3,000. In the year 1915-16, returns were received from six cities and towns with a population under 3,000. In the present year, however, returns have been received from twenty-two cities and towns with fewer than 3,000 inhabitants. In 1914-15, therefore, towns of 3,000 inhabitants or fewer represented only 5 per cent of the total school systems reporting, whereas in 1916-17 approximately 80 per cent of all the cities and towns reporting were under 3,000.

In the summary of the Courtis Arithmetic tests that has been made for this meeting the returns from twenty-seven towns and cities were used, involving a total of 5,472 pupils.

In connection with this year's study in arithmetic I wish to make briefly three types of comparison: first, a comparison of the Indiana standard for 1917 with the Courtis standard and with other state standards as far as they have been worked out up to the present time. You will find four graphs among the exhibits in this room setting forth this comparison, one graph for each of the fundamental operations. The second comparison is a comparison of the 1917 Indiana results with the results obtained in Indiana in 1915 and in 1914, and the third is a comparison of the 1917 achievement of each of the four groups of Indiana cities with the 1917 Indiana state standard. For this comparison the cities are grouped on the basis of population.

TABLE I

THE INDIANA 1917 MEDIANS IN ATTEMPTS AND RIGHTS COMPARED WITH THE COURTIS STANDARD AND WITH THE IOWA (1916) AND KANSAS (1915) STANDARDS

	ADDITION		SUBTRACTION		MULTIPLICATION		DIVISION	
	Speed	Rights	Speed	Rights	Speed	Rights	Speed	Rights
Grade 4								
Indiana 1917..	5.0	2.6	5.6	3.4	4.1	2.6	3.0	1.1
Iowa 1916....	6.2	3.5	6.8	5.0	5.8	3.5	4.2	2.5
Kansas 1915..	5.8	3.0	6.4	4.1	5.2	3.0	3.8	2.1
Courtis......	5.0	5.0	6.0	6.0	5.0	5.0	4.0	4.0
Grade 5								
Indiana 1917..	6.3	3.5	6.8	4.7	5.6	3.3	4.0	2.2
Iowa 1916....	7.4	4.6	8.2	6.6	7.0	4.9	5.5	4.1
Kansas 1915..	7.0	4.3	7.9	5.9	7.0	4.8	4.9	3.3
Courtis......	7.0	7.0	8.0	8.0	7.0	7.0	6.0	6.0
Grade 6								
Indiana 1917..	7.0	4.2	7.8	5.8	6.6	4.4	4.8	3.2
Iowa 1916....	8.5	5.7	9.7	8.0	8.6	6.5	7.0	5.8
Kansas 1915..	8.1	5.3	9.1	7.4	8.1	6.2	6.5	5.5
Courtis......	9.0	9.0	10.0	10.0	9.0	9.0	8.0	8.0
Grade 7								
Indiana 1917..	7.7	4.9	8.9	7.2	7.9	5.7	6.5	5.2
Iowa 1916....	9.1	6.2	10.7	9.0	9.9	7.7	8.5	7.5
Kansas 1915..	8.7	5.8	10.0	8.3	9.0	7.0	9.3	8.1
Courtis......	11.0	11.0	11.0	11.0	10.0	10.0	10.0	10.0
Grade 8								
Indiana 1917..	8.6	5.7	10.4	8.2	9.2	6.8	8.4	7.0
Iowa 1916....	10.0	7.2	12.0	10.6	11.5	9.3	10.8	9.8
Kansas 1915..	9.8	6.9	11.5	9.9	10.9	8.9	10.1	9.3
Courtis......	12.0	12.0	12.0	12.0	11.0	11.0	11.0	11.0

The first comparison, namely, that of the 1917 Indiana standard, with the Courtis standard and with other state standards, is made with each of the four fundamental processes both as regards the number of problems attempted and the number of problems correctly worked

(Table I). In Addition the Indiana achievement, as far as number of problems attempted is concerned, is distinctly lower than the Courtis standard in all grades and noticeably lower than the Iowa and Kansas standards in all grades. As far as the number of problems worked correctly is concerned, Indiana 1917 achievements are lower than the Courtis standards or other state standards.

In Subtraction the Indiana 1917 achievement is distinctly lower than the Courtis standard or the other state standards in all grades in number of problems attempted, likewise in all grades in number of problems correctly solved.

In Multiplication the Indiana 1917 achievement in number of problems attempted is lower in all grades than the Courtis standard and the Kansas standard, and in number of problems correctly solved the same thing is true.

In Division the Indiana 1917 achievement in number of problems attempted is lower in all the grades. In problems correctly solved it is lower in all grades.

The second type of comparison is a comparison of the 1917 Indiana achievement with Indiana achievements in the years 1914 and 1915 (Table II). The accompanying tables give the Indiana standards by grades and by years both in number of problems attempted and number of problems correctly solved in each of the four fundamental operations.

In practically every grade in every fundamental operation the 1917 records of achievement are distinctly lower than those of the years 1914 and 1915, especially those of 1915, which are on the whole higher than those of 1914 and which compare very favorably with the Courtis standard and other state standards. The explanation of these differences, of course, will be one of the significant problems to be worked out in the future. It may be that the 1915 increase over 1914 may be partially accounted for by the fact that eight of the cities included in the 1915 test were also included in the 1914 test, and had presumably attempted during the interval to bring up the work in arithmetic. The 1917 returns are from a wholly different and smaller group of towns and cities, and a future analysis of the conditions in these cities compared with conditions in the cities furnishing returns for 1914 and 1915 may reveal some probable specific causes for the low results this present year. This very fact, however, is a clear instance of the possibility of error in estimating the achievement in arithmetic for a state as a whole on the basis of the returns from a comparatively few cities that furnish the tests upon request. It is not at all clear that the Iowa and Kansas standards are truly state standards or that the Indiana returns for either of the three years are reliable state standards.

The third type of comparison is a comparison of the 1917 achievement of Indiana cities according to population groups with the 1917 Indiana standard (Table III).

The cities and towns giving the arithmetic test in 1916-17 have been divided, as you will notice by the four graphs among these exhibits [not published] into four groups: (1) those cities and towns

TABLE II

A COMPARISON OF THE INDIANA 1917 ACHIEVEMENT WITH INDIANA ACHIEVEMENTS IN THE YEARS 1914 AND 1915

YEAR	GRADE 4	GRADE 5	GRADE 6	GRADE 7	GRADE 8
ADDITION—Number of Problems Attempted					
1914		6.6	7.4	8	9
1915		7 2	8.3	8.9	9.5
1917	4.97	6.33	7.01	7.67	8 6
Number of Problems Correctly Solved					
1914		3.6	4.4	5.	5.8
1915		4.2	5.3	5.7	6.3
1917	2.60	3.54	4.19	4.85	5.73
SUBTRACTION—Number of Problems Attempted					
1914		7.3	8.9	10.1	11.2
1915		7.5	8.7	9.9	10.9
1917	5.61	6.78	7.84	8.86	10.36
Number of Problems Correctly Solved					
1914		5.	6.5	7.8	8.9
1915		5.3	6.7	7 9	8.9
1917	8.35	4.72	5.84	7.17	8.24
MULTIPLICATION—Number of Problems Attempted					
1914		6.3	7.6	8.6	10.2
1915		6.	7.5	8.5	9.9
1917	4.12	5.6	6.63	7.87	9.15
Number of Problems Correctly Solved					
1914		3.9	5.1	5.9	7.3
1915		3.7	5.1	6.	7.3
1917	2.58	3.32	4.46	5.65	6.84
DIVISION—Number of Problems Attempted					
1914		4.5	5.7	8.5	10.6
1915		5.	6.1	7.8	9.7
1917	2.96	3.96	4.8	6.52	8.42
Number of Problems Correctly Solved					
1914		2.6	4.8	6.7	9.
1915		3.3	4.8	6.5	8.4
1917	1.07	2.15	3.2	5.19	7.

TABLE III

A COMPARISON OF THE 1917 ACHIEVEMENT OF INDIANA CITIES ACCORDING TO POPULATION GROUPS WITH REFERENCE TO THE 1917 INDIANA STANDARD

GRADE	ADDITION		SUBTRACTION		MULTIPLICATION		DIVISION	
	Speed	Rights	Speed	Rights	Speed	Rights	Speed	Rights
Group I (Population under 1,000)								
4	4.8	2.8	5.6	3.0	4.1	3.1	3.2	1.2
5	6.1	3.4	6.7	4.3	5.7	3.3	4.1	2.1
6	7.0	4.0	8.0	5.8	7.0	4.9	5.2	3.5
7	8.0	4.8	9.5	7.6	8.6	6.4	7.0	5.5
8	8.4	5.5	10.5	8.5	9.3	7.4	8.6	7.3
Group II (Population from 1,000 to 3,000)								
4	4.9	2.6	5.7	3.0	4.6	2.2	3.0	1.0
5	5.7	2.9	6.5	4.1	5.6	3.2	3.7	1.4
6	7.0	3.8	8.0	5.9	6.8	4.4	5.3	3.6
7	8.1	4.5	9.8	7.4	8.6	6.3	7.9	6.4
8	9.0	6.0	11.5	9.2	10.0	7.5	9.4	8.0
Group III (Population from 3,000 to 10,000)								
4	5.4	3.9	5.9	4.6	4.6	3.0	3.2	2.0
5	7.2	4.7	8.0	6.5	6.5	4.7	4.9	3.7
6	8.2	5.6	8.6	6.9	7.9	5.7	6.3	4.9
7	8.2	5.8	9.1	7.6	8.2	5.9	7.4	6.2
8	9.3	6.7	10.6	8.5	9.7	7.5	8.9	7.6
Group IV (Population over 10,000)								
4	4.9	2.4	5.5	3.2	3.7	1.6	2.8	0.7
5	6.2	3.3	6.4	4.4	5.0	2.6	3.5	1.6
6	6.7	4.1	7.3	5.4	6.0	3.8	4.2	2.7
7	7.1	4.6	8.2	6.7	7.0	4.9	5.6	4.2
8	8.3	5.3	9.7	7.5	8.5	5.7	7.3	5.8
Indiana 1917 Medians								
4	5.0	2.6	5.6	3.4	4.1	2.6	3.0	1.1
5	6.3	3.5	6.8	4.7	5.6	3.3	4.0	2.2
6	7.0	4.2	7.8	5.8	6.6	4.4	4.8	3.2
7	7.7	4.9	8.9	7.2	7.9	5.7	6.5	5.2
8	8.6	5.7	10.4	8.2	9.2	6.8	8.4	7.0

with a population of less than 1,000, of which group there were sixteen school systems; (2) from 1,000 to 3,000, of which there were six; (3) 3,000 to 10,000 of which there were three; (4) 10,000 and above, of which there were two. In connection with these four groups comparison has been made in regard to each fundamental operation and within each operation both in regard to the number of problems attempted and the number of problems successfully solved.

In Multiplication tests results show that in number of problems attempted, Groups I (less than 1,000) and III (3,000 to 10,000) are above the 1917 state median, and Group II (1,000 to 3,000) is above in every grade except the fifth, whereas Group IV (10,000 or above) is below in all grades. For number of problems correctly solved, Group III (3,000 to 10,000) is above the 1917 Indiana median in all grades; Group I (less than 1,000), in all grades except the fifth, which equals the state median; Group II (1,000 to 3,000) is below in the fourth and fifth, equal to in the sixth, and above in the seventh and eighth; whereas Group IV (10,000 and above) is below in all grades.

In Addition tests results show that in number of problems attempted, in Group III (3,000 to 10,000) the achievement is above the Indiana 1917 median in all grades. Group I (less than 1,000) is below in all grades except the sixth and seventh. Group II (1,000 to 3,000) is above in grades seven and eight, equal to in the sixth, and below in the other two grades; whereas Group IV (10,000 and above) is below in all grades. In number of problems correctly solved, Group III (3,000 to 10,000) is distinctly above the state median in all grades; whereas all other groups are below, except Group II (10,000 and above) in grade eight and Group I in grade four.

In Division tests results show that in number of problems attempted Group I (less than 1,000) is above the Indiana 1917 standard in every grade, and Group III (3,000 to 10,000) in every grade. Group II (1,000 to 3,000) is equal to or above in all grades except the fifth. Group IV (10,000 and above) is below in all grades. In problems correctly solved, Group I (less than 1,000) is above the standard in all grades, except the fifth in which it is below. Group III (3,000 to 10,000) is above thruout. In Group II (1,000 to 3,000) it is above in all grades except the fourth and fifth, in which it is below. Group IV is below in all grades.

In Subtraction tests results show that in number of problems attempted, Group I (1,000 or less) is above the Indiana standard in all grades except the fourth and fifth. Group II (1,000 to 3,000) is above in all grades except the fifth. Group III (3,000 to 10,000) is above in all grades, particularly in grade five. Group IV (10,000 and above) is below in all grades. In problems correctly solved, Group I (1,000 or less) is below in the fourth and fifth grades, equal in the sixth, and above in the seventh and eighth grades. Group II (1,000 to 3,000) is below in the fourth and fifth grades, and above in the sixth, seventh, and eighth. Group III (3,000 to 10,000) makes the best showing and is above from one to two points in the fourth, fifth, and sixth grades. Group IV (10,000 and above) is below in all grades.

It seems that these meager conclusions are a scanty return for the time and effort of so many agencies and so many individuals and so much time and money. Doubtless a more intensive study and analysis of these results will reveal things much more worth while. Even at the best, however, studies similar to the ones we are making this year and that have been made in the past only scratch the surface of our real problem. By a more intensive coöperation the University and each interested city should begin more definite experimental work. Thus far in our educational measurements we have gone little farther than we were some ten years ago in medical inspection, when we were satisfied with a picture of the results that the competent medical inspection revealed. At present, however, in our campaign for the health of school children, we are satisfying ourselves only when we have added to the work of inspection, first, that of prevention of ill health; and secondly, that of remedying the evils we were unsuccessful in preventing; and thirdly, that of making ourselves more definitely conscious of the methods by which our good results were obtained. By the mere repetition year after year of tests similar to those we are giving this year, we are largely marking time. But we need not be discouraged in the thought that we are necessarily condemned to this marking time process. There is a way out. We have seen it in our improvement of the health conditions of children in public schools. It is just as clearly visible in connection with the achievement in special subjects in school. It is possible, on the basis of this first step, namely that of revealing conditions, to take the three further steps: one looking toward the avoidance of defective instruction, another looking toward the improvement of defective instruction, and a third looking toward a more conscious and general application of methods used in those phases of the work that our tests have revealed as strong.

The hope of the School of Education of Indiana University is that these three forward steps may be made possible as the first step has been made possible—thru a continuation of the past generous coöperation of the school men thruout the state and of men from other states, for in educational advance as well as in advance in all lines, rapidity is insured only thru unselfish coöperative work, and not by selfish and isolated work. We are anxious to accomplish in our educational measurement work the same ultimate results as are being accomplished in the public school health work, namely, to see clearly what we wish to accomplish, and just to what extent we have failed or succeeded in accomplishing it; to recognize the obstacles which stand in the way of the ideal towards which we are striving; and by overcoming those obstacles and by re-enforcing our successful practices to realize our aim to the fullest possible degree.

The Value and Use of a Scale in Handwriting

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The Necessity for a Standard Scale

In teaching handwriting there are two purposes to be kept in mind by both teacher and pupil. The first in importance is economy of time for the reader, which requires *quality*, as determined by legibility. The second is economy of time for the writer, which requires *speed*. The attempt to secure reasonable quality and speed gives rise to the problem of *method* of teaching handwriting. To determine the efficiency of instruction and the ability of the pupils in speed and quality of handwriting, some standard form of *measurement* is necessary.

In determining the merit of the handwriting of any individual pupil, the teacher or supervisor, by observation, can perhaps judge satisfactorily of the quality. But where, for administrative purposes, the handwriting of a group, such as a whole grade or a school, is to be estimated, a fixed set of standards of scaled variation in quality must be used to measure results. The same means is necessary in making a comparative estimate of the handwriting of the different grades of a school, or of the different schools of a city or county, or of the schools of different cities or counties. Such means is necessary, also, in comparing results from the use of different systems and methods of teaching handwriting.

Such uses of a writing scale furnish valuable data to superintendents, supervisors, and teachers for estimating either the absolute or relative efficiency of a system or a method. Weak places are brought to light; and definite problems are suggested. To illustrate: Professor Ashbaugh, of the University of Iowa, using the Ayres Scale for measuring quality, made a study of the handwriting of 28,000 Iowa school children of 110 towns and cities of the state, and of the rural schools of 14 counties. From the data thus secured, Professor Ashbaugh was able to make conclusions of great value to the educational forces of Iowa, and which could not have been made without the use of a scale. He found (1) that the children in the rural schools of the state write as well and as rapidly as the children in town and city schools; (2) that children in towns and small cities write as well and as rapidly as children in the larger cities; (3) that children improve regularly in the quality of writing as they progress thru the grades; (4) that, by comparing the scores with the Freeman standards, Iowa children write as well as, or a shade better than, the average, and that they write much more rapidly than the average, except in the eighth grade, where they are less than one letter per minute slower; (5) that 75 per cent of the eighth grade children meet the requirements in handwriting of the Municipal Civil Service Commission of New York City. From the data it seems to Professor Ashbaugh that teachers and writing supervisors of Iowa should direct their efforts to bringing up the lower 50 per cent of the children to the Iowa average rather than to attempt to raise the present standard.*

But Professor Ashbaugh's data suggest a further problem, of interest especially to cities having supervisors of writing. This problem may be put in the form of questions. Since the handwriting of Iowa children in the small towns and rural schools (where we may suppose that there is little or no special supervision of handwriting) is practically of the same quality and speed as in the larger cities such questions as the following naturally arise: Is special supervision of handwriting advantageous? Is the subject oversupervised in the cities? Is it poorly supervised? Are the systems and methods used in the cities inferior? Do pupils in the cities devote less time and attention to the subject than do pupils of the rural and town schools of the state? Are

TABLE I

QUALITY, SPEED, AND GAIN IN HANDWRITING OF THE CHILDREN IN GRADES TWO TO EIGHT OF AN INDIANA CITY (SCHOOL 28)

GRADE	QUALITY	SPEED	GAIN IN QUALITY	GAIN IN SPEED
II	30	28	...	...
III	30	33	0	5
IV	31	38	1	5
V	38	44	7	6
VI	46	63	8	19
VII	53	71	7	8
VIII	65	76	12	5

TABLE II

QUALITY, SPEED, AND GAIN IN HANDWRITING OF THE CHILDREN IN GRADES TWO TO EIGHT OF A SECOND INDIANA CITY (SCHOOL 31)

GRADE	QUALITY	SPEED	GAIN IN QUALITY	GAIN IN SPEED
II	68	22	...	...
III	58	37	—10	15
IV	54	39	—4	2
V	55	53	1	14
VI	61	62	6	9
VII	52	73	—9	11
VIII	46	101	—6	28

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* E. J. Ashbaugh. "Handwriting of Iowa School Children." *Extension Division Bulletin* of the University of Iowa, No. 15.

there more unfavorable conditions for learning to write in the larger cities?

For a further illustration of the value of measurement by a scale as giving existing conditions and suggesting pertinent questions to school superintendents, let us examine the data in Tables I and II and Figures 1 and 2. These tables and figures show the handwriting conditions in two Indiana cities.

In working up these data, samples of handwriting from all pupils in both schools in grades two to eight were scored by one person whose percentage of consistency is exceptionally high, being .87 to .99 by the Pearson formula. The Ayres Scale was used.

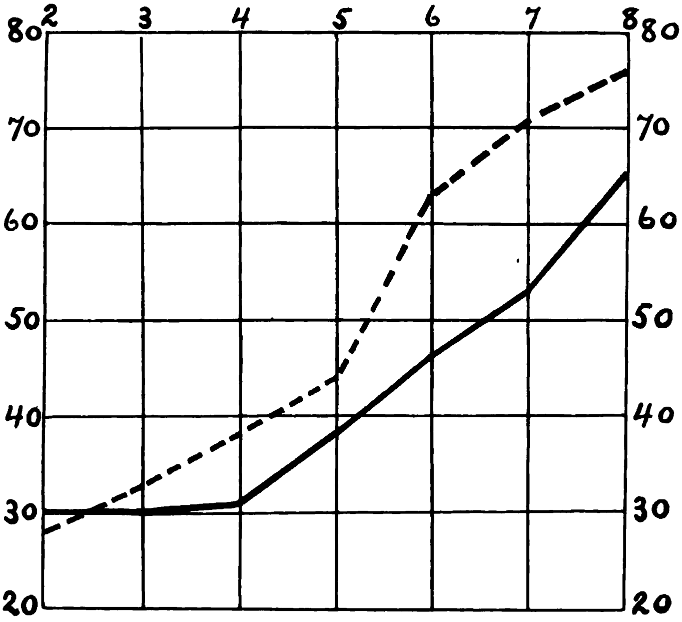

FIGURE 1. GRAPHIC REPRESENTATION OF TABLE I

Observe first the data from School 28. It will be seen that the average quality for the second grade is 30 (see Ayres Scale) and that this quality is held practically unchanged until the end of the fourth year, while the speed increases regularly from 28 to 38 letters per minute. From the fourth grade to the eighth the increase in quality from 31 to 65 is remarkably regular, as shown by the almost straight line in Figure 1. At the same time the increase in speed to 76 letters per minute in the eighth grade is also very regular. The condition is very satisfactory in both quality and speed altho it seems that the speed in grades four to eight might be increased without sacrificing quality. Perhaps the school should give its attention to bringing the lower 50 per cent of the pupils up to the present average of quality and to increasing the speed somewhat in grades four to eight, without attempting to raise the standard in quality. But if by improvement in method and attention the school can increase the quality and speed of the upper 50 per cent without too great expense of time, so much the better.

Now notice the conditions in School 31 (Table II and Figure 2). (1) The quality is very high (68) in the second grade, but runs steadily down (except for a slight improvement in sixth grade) to 46 in eighth grade, while the speed starts very low (22 letters per minute) and increases very uniformly and rapidly to 101 letters in the eighth grade. But an average quality of 46 in the eighth grade is far too low, which seems to indicate that quality has been too greatly sacrificed for speed. (2) Since the very high quality reached in second grade is lost in all the grades that follow, the question arises as to whether much of the time required to raise the quality to 68 in second grade is not wasted. Why strive to secure a quality that is not nearly maintained? (3) The low speed in second grade (2 4/5 seconds to a letter) indicates that the

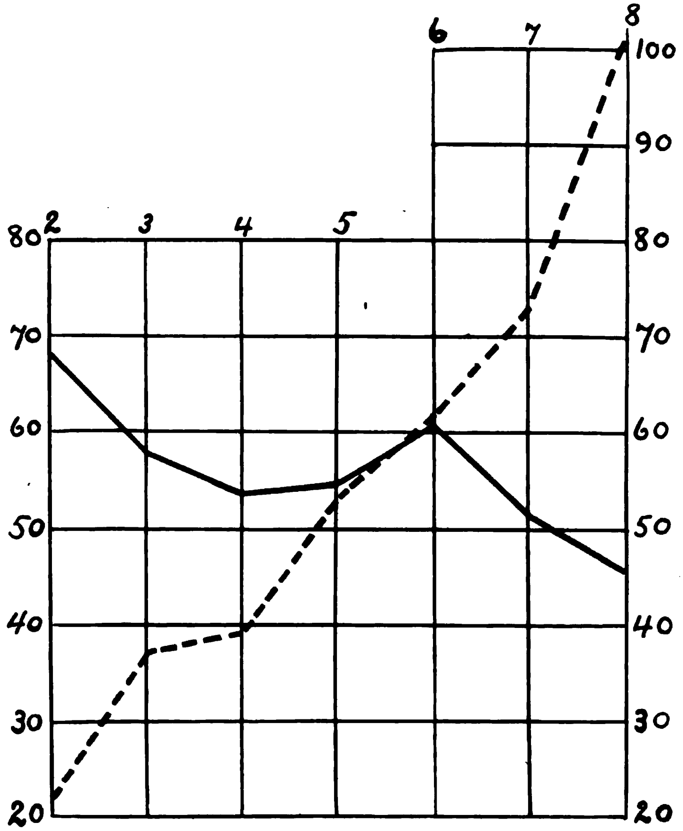

FIGURE 2. GRAPHIC REPRESENTATION OF TABLE II

letters were drawn rather than written. If it should be urged that slow movement is the best mode of learning to produce the proper forms of the letters, there are two answers ready: first, that in School 31 the form suffered after the second year, and second, that with a lower quality and greater speed, School 28 secured a very much more desirable quality in the higher grades, at the same time developing a satisfactory rate. School 31 could undoubtedly improve on its present results by making a comparative study of its own results and those of School 28.

Attention is called to the fact that no reliable study of these schools, either singly or in comparison, could be made without the use of some standardized scale.

THE SCORING OF PAPERS

When writing scales first came into use it was generally thought that measurement of handwriting by the use of a scale was a simple matter, to be done practically as well by one person as by another, and that by its use the scores of one person would be in at least close agreement with those of another. But numerous tests have shown that this is not true.

Individuals without experience in the use of a scale sometimes differ as widely from one another in their scoring with a scale as without. Occasionally the difference has proved greater. The difference is so great that a comparison of scores from different schools made by different persons is unreliable. This unreliability was shown in an attempt to make a study of handwriting in Indiana by using data furnished from 34 Indiana cities and towns. In each city or town all samples were scored either by one person or by a committee of three teachers working together in scoring each sample. The samples from a number of the cities were sent to the writer with the tabulations of the scoring of the committees who did the scoring. These samples were scored again by a paid scorer (D.E), who had made a study of educational measurement in general, and who had had experience in the use of the Ayres Scale. His consistency tested .87 to .99 (see Table IV and explanation) by the Pearson formula. A comparison of D.E.'s scoring with that of the two committees who scored the papers for Schools 31 and 28 referred to above (two of the 34 schools) will serve to illustrate the lack of agreement in the scoring done in the 34 cities and towns. This comparison is given in Table III.

It will be observed that the committee that scored the papers for School 31 gave a much higher average than that given by D.E., while the committee for School 28 gave a little lower average in each grade except the fourth and the fifth. If the committee for School 28 had scored for School 31, Table III would be very different from what it is.

The scorings of an individual are more likely to be consistent (i.e. in closer agreement) than are those of different individuals. But some individuals show a higher degree of consistency than others, even among experienced scorers. This is illustrated in the following test:

Five persons were chosen for the test. All were teachers of experience and students in education at the time the test was made. All had made more or less study of educational measurements. All had had experience in the use of the Ayres Scale. Each scored the same thirty numbered samples of handwriting. All samples were from one copy, on uniform paper, and free from distinctive marks, such as blots and crossed-out words or letters. Ten days later the numbers on the samples were changed and the same five persons were asked to score them a second time. After another ten days they scored the samples a third time. The results of the scorings were tabulated and the correlations between the first and second and between the second and third scorings were determined by the Pearson formula for each scorer. The results are shown in Table IV.

TABLE III

LACK OF AGREEMENT IN SCORING BY TWO COMMITTEES FROM TWO CITIES

GRADE	II	III	IV	V	VI	VII	VIII
Average score by committee for School 31	79	73	65	60	66	68	63
Average score given by D.E	68	58	54	55	61	52	46
Number points of difference	11	15	11	5	5	16	17
Average score by committee for School 28	27	26	33	39	41	46	52
Average score given by D.E	30	30	31	38	46	53	65
Number points of difference	—3	—4	2	1	—5	—7	—13

TABLE IV

DEGREE OF INDIVIDUAL CONSISTENCY OF EACH OF FIVE SCORERS

SCORER	CORRELATION BETWEEN FIRST AND SECOND SCORINGS	CORRELATION BETWEEN SECOND AND THIRD SCORINGS
D.E	.87	.99
F.A	.90	.91
C O	.74	.87
C.W	.75	.79
S.W	.74	.72

But two individuals may each have a high degree of consistency in his own scoring, and yet not be in close agreement with each other; that is, one may be consistently higher or lower in his scoring than the other. This is illustrated in the scoring of the five persons referred to in Table IV, and is shown in Table V. Table V is made up from data obtained from the three scorings of the thirty samples referred to above.

To show further the possibilities in lack of agreement among scorers: If S.W. (of Table V), whose scoring is lower than that of D.E., had scored the samples for School 31, instead of D.E., the difference in points of quality shown by Table III would have been still greater. S.W.'s average scores and the difference in points would have been about as indicated in Table VI.

The question suggested by the foregoing part of this section is how to secure most reliable scoring. The data seem to justify the following answer: (1) Where possible the samples to be compared should be scored by one person who tests high in consistency. He should also be tested to determine whether his scoring is high, medium, or low. Tests should be repeated once or twice a year until the scorer's habits are formed and well fixed. The same person should score for the same system of schools year after year. (2) Where the system is too large for one person to score all papers, two or more persons equally consistent in their scoring may do the scoring for the system. If some regularly give higher or lower scores than others their scores can be lowered or raised proportionately. The same plan can be used in comparing the handwriting in the schools of different cities, towns, or coun-

TABLE V

LACK OF AGREEMENT IN THE SCORING OF FIVE PERSONS, EACH HAVING A GOOD DEGREE OF CONSISTENCY IN HIS OWN SCORING, AND EACH A SCORER OF EXPERIENCE

SCORERS	AVERAGE OF 90 MARKINGS	STANDARD DEVIATION
D.E.	56.0	11
C.O.	53.0	13
F.A.	48.5	11
C.W.	45.5	12
S.W.	44.0	9

TABLE VI

SHOWING INDIVIDUAL DIFFERENCES IN SCORING

GRADE	II	III	IV	V	VI	VII	VIII
Average score by committee for School 31	79	73	65	60	66	68	63
Approximate average S.W. would have given	53	46	42	43	48	41	36
Number of points of difference	26	27	23	17	18	27	27

ties. But the more persons engaged in scoring the less reliable are the scores.

The following suggestions in regard to scorers should be observed: (1) A person who scores any considerable number of papers should do the scoring as a part of his regular school duties, not as extra work. (2) He should have regular hours for scoring, and should go to his work in good physical condition—free from fatigue or illness. (3) He should have a liking for the work, so that he will take a specialist's interest in it. (4) He should make a study of educational measurements in general, and a special study of the measurement of handwriting.

Because of the chances for irregularities in scoring and in making comparative studies of schools, and for the purpose of determining standards in quality, speed, and method, it is necessary to have the aid of a central bureau as a sort of "clearing-house," where educational measurements are studied and tested by specialists, and where experimental work and tests of various kinds are constantly being conducted. To meet such necessity the School of Education of Indiana University maintains a Bureau of Coöperative Research. The bureau will gladly aid in any local study of handwriting, in testing scorers, and in making comparative studies of the handwriting and methods of different schools.

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A Study in Reading (Gray Oral and Silent Reading Tests) in Indiana Cities

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THE report that I am to present must necessarily be brief. In the few minutes that I have I shall make a statement of the time and conditions under which this study was made. You already know that we used the Gray tests. I shall give you a statement in numbers of the immediate results from the entire state, and also by the groups of cities which we have arranged; we shall speak of the number of cities concerned and make a comparison of these three groups of cities arranged according to population.

The time will scarcely permit a detailed analysis of results from individual cities or an adequate discussion of the significance of these definite records for the study of the problems of reading. After I have finished, Professor Judd can give you this diagnosis of the individual results, and Mr. Gray is present to answer any questions you may have as to the method of giving and scoring results.

You have in your hands copies of the material used in the oral tests, that is, the twelve standardized paragraphs arranged in definite order; you have copies of the material used in the silent tests: the record sheet, the sheet of instructions, and then the individual sheets which the pupils use for their reproduction. You can glance hastily over the method, and from time to time I shall try to make clear some of the instructions recorded here. When the study was planned and we had returns from the cities, more than fifty indicated their desire to coöperate in giving the Gray tests. Later when we asked them to confirm their orders before sending out the material that number was reduced to thirty-five, and now for this preliminary report, which is only preliminary, I can report the result from but seventeen cities. We waited just as long as we could, but there are only seventeen cities which could be included at this time.

Originally the idea was to test the entire number of children in the various classes, but the length of time required to give the individual tests led us to decide to permit a minimum number of ten pupils in a class, altho the superintendent could test as many as he chose to test. Thus the number varies in the different cities; one or two cities tested their entire number of pupils in the several classes. Others tested, as I said, the minimum number of ten.

The study was made approximately in February; some cities gave it a few days in February and some a few days at the beginning of March, but approximately it was given during the month of February. The cities were divided into groups according to population so that we might make a comparison of village and small town schools with the larger cities. Group 1 includes those cities which have a population of from 200 to 2,000; Group 2 from 2,000 to 10,000, and Group 3, 10,000 and above.

Because of the small number that sent in returns, the number of cities in the various groups is not adequate to make definite statements as to results, but we can at least indicate the general tendency. In the second grade the total number of children concerned was 500; in the third, 913; in the fourth, 990; in the fifth, 974; in the sixth, 881; in the seventh, 269; and in the eighth, 253.

The total number of children concerned, then, is about 4,800. Before continuing my discussion I should like to say to the superintendents who have coöperated that I think they will be interested in obtaining the monograph recently published ("Studies of Elementary School Reading Through Standardized Tests"), containing Mr. Gray's own studies of elementary school reading thru standardized tests, in which he discusses the derivation of the tests, their validity, their use, and problems which we legitimately study; records the results from Cleveland in detail, and then makes a comparison with cities included in other studies, such as St. Louis and Grand Rapids. The publication can be obtained from the University of Chicago Press.

Seven cities are included in Group 1; five cities in Group 2; and only three cities, and two or three classes from the Fort Wayne Normal School in Group 3. In deciding to use the Gray test we realized the fact stated by Mr. Gray, that achievement in both oral and silent reading must be the basis of determining quality of instruction in reading. Most of the cities decided to give both oral and silent tests.

We asked if possible that the principal or the superintendent give the test, and in most cases that was done. In one or two cities where the teachers themselves gave them, they worked under specific and careful directions from the principals. You notice there you have the specific directions for giving the tests, the method of scoring; you notice the type of error that is to be recorded, and the fact that the number of errors is to be summarized at the end of each paragraph.

Pupils, according to instructions, were permitted to read; if they were in a class below the fifth grade they began with Paragraph 1, if in the fifth grade or above, they began with Paragraph 4. In either case they continued to read until they had made a total of seven errors or more in each of two paragraphs.

A system of scoring was used, based on a combination of the time and the errors, which permits a representation of the score numerically. You notice that Mr. Gray has indicated on the score sheet the method of scoring. The quality, as far as expression and emotional appreciation are concerned, is not recorded specifically; that is, of course, very difficult to estimate; but experimentation has shown that there is a high degree of correlation between expression and oral ability as represented by the Gray score.

The scores for the sixteen cities are best presented by the tables that accompany this discussion. You will have no difficulty in examining the individual scores of the fifteen cities presented in Table I and

TABLE I

AVERAGE SCORES IN ORAL READING IN EACH GRADE ABOVE THE FIRST IN FIFTEEN INDIANA CITIES

CITIES	GRADE 2		GRADE 3		GRADE 4		GRADE 5		GRADE 6		GRADE 7		GRADE 8	
	Number of Pupils	Score	Number of Pupils	Score	Number of Pupils	Score	Number of Pupils	Score	Number of Pupils	Score	Number of Pupils	Score	Number of Pupils	Score
Group 1 (200–2,000)														
1	10	30	10	41	10	41	10	45	10	47	10	38		
2			10	37	21	39	17	43	35	39	22	39	43	41
3	20	33	22	43	14	42	25	43	29	46	22	45	19	43
4	10	46							10	47				
5	19	21	22	42	17	50	22	43	18	46	20	47	17	34
6	14	32	17	28	17	38	21	43	18	55	19	40	16	44
7					10	42	17	40			9	36	10	37
Group 2 (2,000–10,000)														
8	10	37	10	45	10	44	10	48	10	51	10	50	10	54
9	20	41	20	49	20	46	20	50	20	54	20	51	8	48
10	36	37	36	34	24	41	24	43	24	41	12	40	12	36
11			45	45	30	48	51	47	79	42	76	44	60	42
12														
Group 3 (10,000–70,000)														
13			288	39	313	46	324	47	235	46				
14	30	39	40	47	30	47	30	48	30	49	20	55	20	49
15							22	40	16	47				
16	325	27	149	37	342	41	125	43	279	40				
Total	494		669		858		718		813		240		215	
Average		34		40.5		43.4		44.5		46		44		42.8
Gray Standard		43		46		47		48		49		47		48

TABLE II

AVERAGE SCORES IN ORAL READING IN EACH GRADE ABOVE THE FIRST FOR GROUPS 1, 2, AND 3

CITIES	GRADE 2		GRADE 3		GRADE 4		GRADE 5		GRADE 6		GRADE 7		GRADE 8	
	Number of Pupils	Score	Number of Pupils	Score	Number of Pupils	Score	Number of Pupils	Score	Number of Pupils	Score	Number of Pupils	Score	Number of Pupils	Score
Group *1*	73	32.4	81	38.2	89	42.0	112	42.8	120	46.7	102	40.8	105	39.8
Group *2*	66	38.3	111	43.3	84	44.8	105	47.0	133	47.0	118	46.3	90	45.0
Group *3*	355	33.0	477	41.0	685	44.5	501	44.5	560	45.5	20	55.0	20	49.0
Total	494		669		858		718		813		240		215	
Average		34.0		40.5		43.4		44.5		46.0		44.0		42.8
Gray Standard		43		46		47		48.0		49.0		47.0		48.0

in seeing how the various groups presented in Table II compare with each other, with the state median, and also in each case with Mr. Gray's standard, which he derived from testing 2,654 pupils in three or four states. In these two tables everything is definitely indicated, the number of children in each city, grade, or group, and the score made by each.

The average oral reading scores for Indiana are compared with the average scores which were secured in a number of other investigations in Table III. The investigations have been listed in the order in which they were given during the school year. On the whole, Indiana does not compare unfavorably with the results from Northern Illinois. It parallels; it very closely reaches it in grade three, and there almost touches again in grade six, and then drops a trifle below it in the seventh and eighth. On the other hand, Grand Rapids, where the tests were given at about the same time in the school year as in Indiana, secured distinctly superior results. Of course, we are below the Gray standard, varying from 3 to 9 points all the way along. St. Louis stands very much above the standard, and she does that straight thru in both the oral and silent tests, a condition that shows the effectiveness of the instruction in St. Louis.

TABLE III

AVERAGE ORAL READING SCORES

CITIES	DATE	GRADE						
		2	3	4	5	6	7	8
23 Illinois Schools	September, 1914	20	28	39	43	45	46	....
Northern Illinois	October, 1916	28	42	43	47	47	46	45
Indiana	February, 1917	34	40.5	43.4	44.5	46	44	42.8
Grand Rapids	March, 1916	44	47	49	50	47	48	48
Cleveland	June, 1915	42	46	47	48	49	47	48
St. Louis	June, 1916	47	50	52	51	51	51	51

You will be interested in making comparisons with St. Louis and Cleveland. St. Louis excels straight thru the reading tests; in quality she is much superior to Cleveland, while Cleveland excels in the rate, but Cleveland shows a great many more inaccuracies in every grade but one, showing that perhaps speed has been emphasized at the expense of accuracy. St. Louis, it may be, could bring up her record in speed, but of course that is yet to be determined. On the whole, we may say that the records apparently indicate at least that the instruction in St. Louis is quite effective at the present time.

Cleveland shows up better in the lower grades than in the upper ones, showing, of course, the thing which I have just said: that perhaps speed in the lower grades has been emphasized and verbal facility has been developed at the expense of comprehension, mastery of result, which brings up the whole problem of rate versus comprehension.

I would like for a moment to speak of the relative scores for Indiana as a whole, the cities as a whole, and these different groups. You see in the first group there are the rural and town schools; in the second group cities up to 10,000 population, in the third group cities of 10,000 and above. On the whole, the best record made in oral reading is that of the second group. The Gray Standard in the second grade is 43. The average for Indiana is 34, while this second group shows up with an average of 38; you see, 5 points below the standard. This is a bit better than Northern Illinois, which has but 28 for the second grade.

In the third grade where the standard is 46, Indiana's average is 40; our best group has an average of 43. In the fourth grade the standard is 47, Indiana's average 43; and that of the best group 44.8. The fifth grade standard is 48; our average is 44; Group 2 shows up with an average of 47, practically standard. In the sixth grade the standard is 49, Indiana has 46, and this group 47. The seventh grade standard is 47, Indiana 44, and this particular group 46. In the eighth grade Indiana drops down to 42 as compared with the standard of 48, whereas the best group has a record of 45. You see on the whole Group 2 is best from the second to the sixth grade, Group 3 is superior in the seventh and eighth, while the first group is poorest straight thru; that is, in oral reading.

The best cities, on the whole, in oral reading are Cities 14 and 9. As a close second City 8 has high records in fifth, sixth, seventh, and eighth grades, but they are a little inconsistent; their progress is irregular in the lower grades.

It is impossible for me to speak of all these. I should like to speak, for example, of City 5 in the second grade; they drop down to 21, while in their fifth grade, for example, they go up to 50. Fifty there, you see, is 2 points above the average. There is evidently some corrective work needed in that second grade. City 8 is, perhaps, the median and ranks next to Cities 9 and 14.

I shall have to pass on rather quickly to silent reading. You have there in your hands the cards showing the selections, Tiny Tad, the Grasshoppers, and Ancient Ships. In addition to that you have these reproduction sheets for the pupils and you have your instruction sheet showing the nature of the tests and the method of scoring. The standard for the silent reading tests was derived from these same thirteen cities which I have mentioned, with a total of 2,654 pupils.

The scores in the rate of silent reading are shown in Table IV and the cities are definitely indicated in the same fashion as in Table I.

The Gray standard in the rate of silent reading for the second grade is 1.5; that is, 1.5 words per second. Indiana comes up to the standard with a record of 1.5. In the third grade the standard is 2.3, and we have a score of 2.1 which is slightly low, but the best city, or best group, Group 2, has a record of 2.3 and so on thru. We come a bit closer to the standard in the rate of silent reading than we did in oral reading. There is a difference of only from one to two-tenths words per second in all grades. Our record is superior to that of the cities of Northern Illinois in this case, but we do not attain the standard reached by St. Louis except in the seventh grade, and there St. Louis, the In-

TABLE IV

AVERAGE RATES IN SILENT READING IN EACH GRADE ABOVE THE FIRST FOR FIFTEEN INDIANA CITIES

CITIES	GRADE 2		GRADE 3		GRADE 4		GRADE 5		GRADE 6		GRADE 7		GRADE 8	
	Number of Pupils	Rate	Number of Pupils	Rate	Number of Pupils	Rate	Number of Pupils	Rate	Number of Pupils	Rate	Number of Pupils	Rate	Number of Pupils	Rate
Group 1 (200 2,000)														
1	10	1 40	10	2 40	10	1 80	10	3 15	10	2 80	10	3 11		
2			13	2 40	21	2 00	17	2 10	37	2 80	21	3 00	43	2 90
3			22	1 38	14	1 31	25	1 90	29	2 28	22	2 08	19	2 20
4	10	1 53							10	2 86				
5	25	1 20	20	2 03	23	1 60	22	1 80	18	2 94	20	3 24	17	2 99
6	14	1 33	17	1 33	17	2 32	21	1 87	18	2 70	19	2 08	16	2 04
7					10	1 70	16	2 14			8	1 78	10	2 30
Group 2 (2,000 10 000)														
8	10	2 50	10	3 01	10	1 74	10	1 93	10	2 50	10	2 45	10	2 73
9														
10	36	1 42	36	1 86	24	2 01	24	2 64	24	2 17	12	3 38	12	2 99
11			115	1 07	100	2 10	117	2 36	81	2 64	77	2 55	56	2 70
12	20	1 37	50	1 56	50	2 02	50	2 43	50	2 75	50	2 66	50	2 61
Group 3 (10,000 70,000)														
13			287	1 93	300	2 00	316	2 33	238	2 85				
14	30	1 44	40	2 68	30	2 50	30	2 88	30	2 96	20	3 05	20	3 20
15							22	3 67	16	2 60				
16	345	1 09	293	1 94	381	1 93	204	2 47	310	2 66				
Total	500		913		900		974		881		260		253	
Average		1 80		2 07		1 98		2 44		2 67		2 81		2 79
Gray Standard		1 80		2 30		2 20		2 57		2 79		2 60		2 87

TABLE V

AVERAGE RATES IN SILENT READING IN EACH GRADE ABOVE THE FIRST FOR GROUPS 1, 2, AND 3

CITIES	GRADE 2		GRADE 3		GRADE 4		GRADE 5		GRADE 6		GRADE 7		GRADE 8	
	Number of Pupils	Rate	Number of Pupils	Rate	Number of Pupils	Rate	Number of Pupils	Rate	Number of Pupils	Rate	Number of Pupils	Rate	Number of Pupils	Rate
Group 1	59	1.39	82	1.90	95	1.79	111	2.16	122	2.73	100	2.64	105	2.41
Group 2	66	1.79	211	2.33	184	1.99	201	2.34	165	2.53	149	2.76	128	2.76
Group 3	375	1.26	620	2.18	711	2.14	662	2.84	594	2.76	20	3.05	20	3.20
Total	500		913		990		974		881		269		253	
Average		1.50		2.07		1.98		2.44		2.67		2.81		2.79
Gray Standard		1.50		2.30		2.20		2.57		2.79		2.69		2.87

TABLE VI

AVERAGE QUALITY SCORES IN SILENT READING IN EACH GRADE ABOVE THE FIRST FOR FIFTEEN INDIANA CITIES

CITIES	GRADE 2		GRADE 3		GRADE 4		GRADE 5		GRADE 6		GRADE 7		GRADE 8	
	Number of Pupils	Score	Number of Pupils	Score	Number of Pupils	Score	Number of Pupils	Score	Number of Pupils	Score	Number of Pupils	Score	Number of Pupils	Score
Group 1 (200–2,000)														
1	10	51	10	41	10	13	10	28	10	23	10	11		
2			13	36	21	16	17	27	37	27	21	19	43	26
3			22	28	14	24	25	34	29	42	22	21	19	27
4	10	40							10	34				
5	25	21	20	28	23	21	22	30	18	24	20	17	17	22
6	14	46	17	41	17	12	21	25	18	29	19	16	16	24
7					10	20	16	27			8	15	10	19
Group 2 (2,000–10,000)														
8	10	35	10	32	10	32	10	35	10	41	10	25	10	27
9														
10	36	27	36	29	24	23	24	24	24	30	12	16	12	12
11			115	35	100	24	117	24	81	27	77	20	56	27
12	20	23	59	31	50	17	50	29	50	33	50	23	50	30
Group 3 (10,000–70,000)														
13			287	32	300	19	316	27	238	30				
14	30	25	40	31	30	26	30	31	30	32	20	20	20	20
15							22	25	16	33				
16	345	25	293	33	381	20	294	24	310	32				
Total	590		913		990		974		881		269		253	
Average		39.5		33.1		20.5		27.8		31.1		18.7		23.4
Gray Standard		32		37		29		32		39		22		27

TABLE VII

AVERAGE QUALITY SCORES IN SILENT READING IN EACH GRADE ABOVE THE FIRST FOR GROUPS 1, 2, AND 3

CITIES	GRADE 2		GRADE 3		GRADE 4		GRADE 5		GRADE 6		GRADE 7		GRADE 8	
	Number of Pupils	Score	Number of Pupils	Score	Number of Pupils	Score	Number of Pupils	Score	Number of Pupils	Score	Number of Pupils	Score	Number of Pupils	Score
Group *1*	59	39.5	82	34.8	95	17.6	111	28.5	122	29.8	100	17.0	105	23.6
Group *2*	66	28.3	211	31.7	184	24.0	201	28.0	165	32.5	149	21.0	128	24.0
Group *3*	375	25.0	620	32.0	711	21.6	662	26.5	594	31.7	20	20.0	20	20.0
Total	500		913		990		974		881		269		253	
Average		32.5		33.1		20.5		27.8		31.1		18.7		23.4
Gray Standard		32		37		29		32		39		22		27

diana, and Northern Illinois cities are all above the standard; that is, in the seventh grade.

Table V shows the comparative standing of the several groups again. You will notice that Group 1 is lowest; Group 2 has better scores. Group 3, in this case, has the best record, altho in certain instances Group 2 surpasses it.

Again we find that the same statements could be made about St. Louis's rate and quality of silent reading as oral reading; again she is superior to Cleveland, but the Indiana standard here is superior to that of Northern Illinois.

The best records and the poorest records here again show the same wide range that appeared in the oral studies. There were two overlapping, particularly in fourth, fifth, and sixth grades, and very often there is a difference between seventh and eighth grades, or, in fact, the seventh grade may be superior to the eighth grade; this is especially true in small schools. That is rather interesting when in the past we have insisted that the small schools, country and small town schools, emphasize reading as one of the three arts.

When it comes to quality (Tables VI and VII) we do not have the same statement. We find that Group 1 is superior in the second, third, and in the fifth grade; it drops down in the other grades, and Group 2, then, is superior in the upper grades.

You notice the difference, the unevenness of the results. Group 1 has an average, for example, of 39.5 in the second grade, 7.5 points above the standard; in the third it is 2 points below standard; and in the fourth and on, it is from 3 to 11 points below standard. That, of course, is decidedly interesting. It does not show continuous progress at all, but rather decidedly irregular progress.

Here is an interesting fact in Group 2. The third grade is above the standard in speed; you have 2.33 as compared with 2.30 and yet it drops down to 32 in quality as compared with the standard of 37. A record like that indicates definitely where the emphasis needs to be placed. To be sure, a definite statement is premature and unwarranted, and yet on the face of it you might say there that you need definite emphasis on quality. On the whole, in this group in quality, taking all the averages into consideration, the third and sixth grades seem farthest below standard in quality, with averages of only 31.7 and 32.5 when they should have 37 and 39 respectively. The second and fourth are next poorest, while the seventh and eighth are nearest standard. Examination of these individual tables will show in what respects the individual cities are weakest and strongest; it shows also whether there has been overlapping, or whether there has been continuous progress, whether there is acceleration in one grade and retardation in another. All of that can be clearly determined.

Now, let me summarize briefly the best cities and poorest. City 14 probably ranks highest in all respects. In quality City 11, for example, is very high in third, seventh, and eighth; it drops very decidedly in grades four, five, and six. You see, that indicates a definite situation which could be handled. City 5, one of the poorest cities in oral reading achievement, is very low in second and eighth grade, and yet the third is not so bad, and in grade four they jump way up to 50, far above the average, and I fancy they will have to explain that to us. In the sixth and seventh also they have a splendid record. City 8 has a very high rate in the second grade in silent reading, and inferior quality in the next grade. You have exactly the opposite result. A further study of these records will permit an explanation of some of these questions which we cannot at the present moment determine. Of course, the inequalities may be due to differences in emphasis in giving the tests. In some of these schools conditions are very different for giving tests, and again the differences may be due to actual objective conditions within the schools.

Suggestions Pertaining to the Training of Feeble-Minded Boys in the Public Schools

CALVIN P. STONE, Psychologist, Indiana Reformatory

PRISON walls have not, in themselves, the power of implanting in delinquent youth the capacity for reformation. This capacity, like the capacity to be normal, is a heritage from nature, to which little may be added and from which little may be taken away. And those individuals who are so constituted that they can undergo permanent reformation in a correctional institution possess the qualities and powers of men who do not violate the laws of person, property, and public order. But those who are not so constituted, despite all efforts at reformation, are destined to continue a life of criminal activity unless deprived of their freedom.

This view of the reformatory situation, altho enshrouded with murky darkness, is now quite generally accepted by men of keenest discernment who are engaged in the administration of justice from the bench, as well as those employed in correctional institutions; and, in their opinion, the duty of society, in respect to the present and future perpetrators of crime, is twofold: (1) permanent segregation or incarceration of habitual criminals and those who, because of physical, intellectual, or moral defects, have repeatedly shown their incapacity for functioning normally in society; and (2) the discovery at an early age, for the purpose of discipline and industrial training, all high grade defectives and so-called normal boys in whom normality is usually more apparent than real, who cannot be induced to follow the regular routine of school work as it now exists.

Obviously, the first phase of this problem is one to be solved by the alienists, the courts of justice, and the penal institutions; but the second is one in which the public school must play a prominent rôle, for to it is entrusted the work of fitting youth for a life of usefulness and service. And since the defective mind, undisciplined and void of industrial training, is the fertile soil from which a harvest of delinquents is reaped each year, it is imperative that superintendents and principals of school systems over the state of Indiana concert their efforts in initiating and perpetuating a reform movement for the training of defectives which will make useful, or at least self-supporting, citizens of a great number of our young men who otherwise would land in correctional institutions.

To further the work of making this reform movement general thruout the state, the research laboratory of the Indiana Reformatory desires to offer its service. The institution will gladly coöperate with city superintendents or departments of education in universities and normal schools of the state by placing in their hands, in so far as it is practicable, results of research work. During the past four years this laboratory has developed a technique of procedure by means of which valuable data concerning delinquent men are being gathered. These data are not only of practical value in handling men within the institution, but are also of value to the Board of State Charities and other organizations interested in the problems of mental hygiene, pauperism, and crime. No doubt, psychographs from our files will be of value to superintendents desiring to familiarize themselves with typical cases of delinquency.

As certain charts now on exhibition are intended to show, the intelligence level of our reformatory is much lower than most people are willing to believe. Standardized tests show that the average mental age based on results of some two thousand cases is less than twelve years—that is to say, nearly forty per cent of the men committed to the Indiana Reformatory are so defective in general intelligence that they fall within the moron and border-line groups.

Of the entire inmate body, there is a group of men, relatively small in number—probably less than fifteen per cent—who not only have had excellent environmental advantages, but also have manifested from the earliest age the capacity for developing into capable, honorable, and law-abiding citizens; but who, because of some peculiar twist of circumstances or from defects of mind or body so subtle and recondite as to be indiscernible to the closest scrutiny of the alienist, have failed to meet their obligations to society. And there is a second group, large in number, consisting of individuals born short of the potential qualities which make for normality; men in whom, because of this shortage at birth, there is lacking that impulse from within which initiates in its season the natural unfolding of instincts in such relation as to give poise and balance to their reactions to the spiritual and physical forces of their environment which are intended to fit them for useful lives in society.

To this group I especially desire to call attention in this short paper, for it constitutes the greatest problem of the correctional institution.

A clinical examination of the men of this group lays bare grave deficiencies in mental and physical development and warrants the conclusion, ofttimes stated heretofore by psychologists, criminologists, and alienists, that they are intellectual, emotional, and volitional dwarfs, predestined by nature to bear thruout life the stigma of degeneracy. The entire life of some of these men is a continuous revelation of the lack of practical judgment, common sense, and ability to avoid errors and surmount the difficulties of daily life. In the realm of emotion, dwarfism is revealed by the lack of altruism and regard for the rights and privileges of others. Defects in the volitional sphere are manifested by the inability to control impulses; not alone to restrain impulses prompting actions inimical to self and others, but also to guide and direct impulses toward the performance of acts of positive value. Thus, in this group are found men who are ignorant and cannot learn what is right, men who have no desire to do what society says is right, and lastly men who are unable to execute that which they not only know is right but ardently wish to accomplish.

The following psychograph is typical of one devoid of intelligence;

and, if time permitted, cases typical of deficiency in the realm of emotion and volition could be cited.

The boy in question is of German parentage, and at the time he entered the institution was only sixteen years of age. One morning in September while going to work, with a dinner pail on his arm, he was stopped by two boys, who asked him to join them in a tramp over the country. They offered to finance the excursion and quickly overruled his first objections to leaving his job. They started at once and after riding several miles on a freight train were kicked off by a brakeman, near Plymouth, Ind. In order to add to their meager supply of money, they worked a day or two for a farmer, picking pickles, and then resumed their tramp, this time "hitting the ties". After walking a few miles they came upon a handcar standing beside the track. One boy suggested that they set it on the rails and drive it to the nearest town. The others agreed, and in a short time they were off. Presently they approached a signal tower, where a detective who saw them coming put himself in a position to stop them. Anticipating his action, they slowed down the car and got off. As the officer approached, the older and brighter boys ran into a cornfield, but the subject did not have even sufficient initiative to follow. He was arrested and taken to court. The judge, not knowing what else to do with him, sentenced him to the Indiana Reformatory.

This boy attended a Lutheran parochial school between the ages of six and fourteen, spending two years in each grade and receiving promotions without actually doing the work. He can neither read nor write; and, what is more, without a great deal of personal attention he will never be able to do so.

He has almost no stock of information. He does not know the name of our President, the largest city in the United States, the largest city in Indiana, or Ohio, or what state is east or west of Indiana. He has no knowledge of such men as James Whitcomb Riley, Abraham Lincoln, or George Washington, and has never heard of Panama, the Kaiser, or Arizona. He can with a little help count from one to one hundred, and recognizes numbers up to forty. He can write his own name and is able to spell his surname orally but not his Christian name. He cannot write the name of any member of his family.

According to the Binet scale, his mental age is eight years. He passed all tests for seven-year-olds and sufficient other tests to give him an additional year. His auditory memory is about equal to that of a normal seven-year-old boy. He repeated six digits but failed on seven and was unable to repeat a sentence of twenty-two syllables. He cannot name the days of the week, does not know the present day of the month, and does not even know the month in which he left home. In three minutes he was able to give only thirty words, altho a normal ten-year-old child can give sixty or more. He was unable to make a sentence in which the words "Louisville, river, money" were used. He did not detect gross absurdities in statements given him, and failed to comprehend easy problems pertaining to conduct. When asked to draw a diamond that was placed before him he succeeded only when the point was toward him, and failed in seven attempts when the large angle was toward him. He recognizes pieces of money, but is unable to combine them to get a sum. In evaluating several coins amounting to forty-eight cents in all, the coins being a quarter, four nickels, and three pennies, he failed utterly. Having given him twenty-four cents, four nickels and four pennies, as his change, I submitted the following problem: "I am going to buy from you five cents' worth of candy, a nickel's worth of peanuts, and a nickel's worth of rolls. I will give you a quarter. From your change box return the change that I should receive." His answer to the problem was: "You don't get no change." A second problem was given him in which I bought a dime's worth of goods and gave him a quarter. He returned ten cents as my change.

Form board tests revealed poor perception of size and volume, and likewise poor motor coördination. He was unable in the three trials given him to work out a definite plan of procedure by means of which he could reduce the time and errors. On the Healy instruction box he followed the first four steps toward opening the box, but failed on all succeeding steps. After the second and third demonstrations he merely repeated his procedure after the first demonstration; no improvement whatever was noticed. Subsequently, the fourth demonstration was given, after which he did successfully five steps but failed to do the remaining two steps which would have brought success in opening the box.

This subject is a low grade moron, and because of his lack of intelligence was unable to do any of the work given him in the school which he was by law compelled to attend. His case is typical of a great number of boys now confined in our institution. Notwithstanding grave deficiencies of mind, when they were of school age our public schools treated them as normal children and attempted to make them master a regime of mental activity which they were incapable of mastering and which their after-life has seldom given them an opportunity to use. Teachers, inspired with the ideal of maintaining the class as a unit rather than considering them as individuals, formed a habit of nagging and scolding, which created in the minds of the dullards a dislike for school work, and caused them to associate everything that is bad with the teacher and her school. The result of this is truancy and incorrigibility on the pupil's part. It is a notable fact that truancy and incorrigibility usually begin when the defective is approaching the limits of his capacity to do school work. Idleness resulting from truancy is ofttimes followed by petty thievery and misdemeanors. These misdemeanors serve as a hardening or seasoning process, which, in connection with recklessness at puberty and during the period of adolescence, starts these young boys out on a criminal career that may not be checked even inside the walls of a reformatory. It is clear to see that the schools must make more adequate provisions to meet the needs of the subnormal children. Since they must of necessity be the hewers of wood and drawers of water in our industrial system, it must give them an opportunity to learn a trade or engage in a form of labor suited to their physical strength and mentality which will serve the double purpose of forming habits of industry and of preparing them for making their living after they have left school. Let the school require them to work with their hands, all day if necessary, giving them when occasion arises the opportunity to learn to read and write.

The hope of the reformatory lies in the belief that there is in every man the capacity for developing what Professor Veblen calls "a sense of the merit of serviceability or efficiency and of the demerit of futility, waste, or incapacity".

This is virtually an ideal of workmanship by virtue of which one does his share of the world's work in the best manner that it can be done regardless of the selfish interests prompting him to leave it undone. This ideal is a perpetual motive which goads the individual on thru those periods of depression and dissatisfaction which come to everyone, in which he has a desire to throw up his job. The rudiments of this ideal are founded in the instinctive love for praise and avoidance of dispraise of others, and are possessed by every boy. The normal boy has an opportunity to develop this ideal in his daily school work because that work is so adjusted as to difficulty that he can master it and view the finished product with satisfaction; but not so in the case of the feeble-minded boy. He is not able to master the work; hence he never feels that glow of pride which comes from putting his efficiency in evidence, and he loses the praise from others which is given in recognition of meritorious work. As a result, these basic instincts, which, when properly directed, develop into an ideal of workmanship, become perverted. This is what has occurred in a great number of men in our institution. Those who engage in the various forms of skilled and manual labor are not motivated by a strong desire to acquire proficiency in their line, to satisfy their employer, or to render a real service. Instead, their chief source of emulation is habits of "conspicuous waste" or "conspicuous consumption" of their earnings. Lavishness in dress, prodigality in wasting their money on worthless associates, and a total disregard for the future become to them a source of esteem. Obviously, such habits are antithetic to the ideal of workmanship, and in time cause it to sink into the background so that it is no longer a motive prompting the individual to do his work well. As a result he loses his position; but notwithstanding loss of position and loss of income, his habits of living do not change and his desire to continue a life of "conspicuous waste" and "conspicuous consumption" of money soon exhaust his savings and drive him toward a life of crime, in which he resorts to predatory methods of seizure and pillage.

Most of these boys can never be self-supporting in the sense that normal boys are self-supporting. The feeble-minded must always be considered dependent; yet, if they are taught to work diligently and persistently at a kind of labor suited to their strength of body and mentality, friends or relatives need do little more than furnish them a protected environment, a thing which can be done in the majority of cases without great cost to anyone. Everyone knows of feeble-minded boys or girls in his community who are doing this very thing, and are passed almost unnoticed by those about them. In a great number of farm districts boys and girls of this type are to be found. From early childhood they have been led to form habits of industry. They know nothing but work; they have learned to enjoy it, and as skill has come thru long training they look with pride upon their achievements.

In closing I should say by way of summary that the imperative duty of the public schools relative to the feeble-minded boys is, first, to discover them at the earliest age possible; secondly, to give them a kind of work that is suited to their mental capacity in the hope that, thru continuous application, in each individual there will be developed an ideal of workmanship that will make him see that efficiency and serviceability alone are meritorious and that inefficiency and waste are futile; and, lastly, to give whatever assistance it can in placing these children in a protected environment which will be as free as possible from degrading influences tending to bring them into conflict with the law.

Experimental Work in Indiana Schools

WILLIAM F. BOOK, Professor of Educational Psychology in Indiana University

THE purpose of this conference, as it has been expressed and talked over from time to time by those of us who have been connected with the work from the start, has been to hear reports of the studies made by the school people of the state in coöperation with the Bureau here at the University, and to bring to the conference each year one or more men actively engaged in the scientific study of the problems undertaken by the Bureau and the school people of the state during the year, men who could give us new ideas in regard to method and helpful suggestions in regard to the studies which we were trying to make, and who would inspire us to greater endeavor in the study of the educational problems we had undertaken to solve. It has, in the third place, been the purpose to make the conference a sort of clearing-house for all scientific work done on educational problems by the school men of the state during the year. We have felt that a part of the time at each conference should be devoted to a discussion of results and methods employed in all types of educational research carried on in the state during the year.

The purpose of the University in establishing and maintaining this conference and a Bureau for Coöperative Study of Educational Problems has been at various times expressed in some such ways as these: We wanted to try to make a contribution to our knowledge of educational science by helping the school men of the state make some of the studies needed to put our work on a more efficient and economical basis. We hoped also to stimulate by this means the scientific study of educational problems thruout the state.

There is a difference between having an experiment made in the University laboratory by so-called scientific experts, who know little or nothing about the conditions under which the teacher and superintendent work, and making a coöperative study such as we are trying to make by having the men and women engaged in actual school work do all they can in coöperation with a group of men and women who are making a special study of the methods involved. It is believed that if some of our many difficult problems were worked at coöperatively and if those actively engaged in the practical phases of school work could take a more prominent part in making these studies, better trained educational workers would be produced for the state. Furthermore, our methods and results would be constantly checked up by those in a position to judge of their practical value. It has also been the purpose to render actual aid to the school people of the state in making these studies by doing at the University the things which could not be done by the different school officers, or the cities that wanted to make such studies.

Some or all of these results have been achieved to an encouraging degree. Four years ago little or no scientific work was attempted by the school men of the state. This year thirty-five cities have coöperated in the studies made by the Bureau, many more than ever before. More lines of work have been undertaken than during any previous year, and I think much better work has been done than at any time previously.

One thing that has occurred to me during the last two or three conferences is the need of more criticism of our methods, procedure, and results. We need to criticize them more closely than we have done. Otherwise, we will make ourselves believe that we have something when we haven't anything which works. Much has been done in the state this year independently of the Bureau of Coöperative Research. Many cities, teachers, and superintendents have been studying some of their own problems this year by methods discussed and worked out here in previous conferences. Many of our superintendents and principals and teachers have also gotten in the habit of going to the University here, or to Chicago, or Columbia, or Wisconsin, for a summer term or year to get a problem which they could work out in their own school system the next year, and so improve themselves by making an actual contribution to the science of education.

I am not sure that I am informed with regard to all that has been done in these ways during the year. There are in the state that I know of at the present time fifteen men and women engaged in public school work who are working out as a part of the requirements for an A.M. or Ph.D. degree some practical problem in education. There are twice this number working on similar problems in the University here, men and women who intend to take up educational work as a profession in Indiana. We lose these men almost as rapidly as we produce them, be it said to our shame, because we let other states take them as rapidly as they are trained. But some of them will come back and work right here in Indiana.

Mr. Stone, one of our own graduates, has been making, during this year, a very interesting study in clinical psychology and certain educational problems met with at the Indiana Reformatory in Jeffersonville. This is a line of work that should be very highly commended. There are many problems in this field that need to be worked out. We also have a group of problems presented by our charitable institutions and our state charity workers and by our reformatories, our so-called state institutions. The work of these state institutions presents a number of important educational problems that should be attacked by the application of scientific method and solved. The University should not only lead in their solution, but train men and women for each of these important lines of work. It is a part of the educational work of the state.

But besides these types of special research the following specific studies have been made in the state this year, in addition to the work done by the Bureau of Coöperative Research here at the University: At Richmond they have made a study of writing, one term apart, using the Ayres scale. At Madison they gave the Courtis tests in arithmetic to all pupils in the grades between the fifth and eighth, and will repeat these tests after systematic drill has been carried on. At Franklin they gave the Courtis tests in arithmetic and made a rather careful and unique study of the mistakes with a view of finding out how to remedy the situation, revealed by the measurements of achievement which they applied. At Frankfort an important and comprehensive program of study has been carried on. All the teachers took some part, either in a program of professional study or in the industrial survey, or in some particular line of research adapted to small groups of teachers. To make this work all the more effective teachers and superintendent would meet together and discuss the results obtained and the methods used, trying to make actual application of the facts which they found, and improvements in the methods of investigation they were using. For example, 300 children were tested by the Binet-Simon scale. The Courtis tests were given in the eighth grade and Stone's test in the sixth grade. The health conditions and physical defects of the school children were studied by one group of teachers and the entire results and their applications discussed at a meeting of all the teachers. Ayres spelling tests were given by another group of teachers, and the results of the different grades and in different buildings studied and compared. Writing and Gray's reading tests were given, I think, in all the buildings. A careful study of the industries of the community was made according to a definite schedule. An age and grade table was worked out for the entire city and discussed in the early part of the school year, the causes and per cent of retardation determined. The results of the school enumeration for a period of years preceding were also collected and studied.

Now, as I stated when I began, one of the ideas that we have had in mind in conducting these conferences is to make the conference here a sort of clearing-house for the discussion of results obtained not only by the Bureau, but for any work that has been done by the school people in the state during the year. So I would like to ask for reports on this work at this time. Mr. Webb, for example, has been making a special study at Franklin and I am going to call on him to tell us what he has done and the results he has obtained.

MR. WEBB: I am not prepared to make a formal report at this time, but I might make this distinction between the Woody test and the Courtis test: The range of difficulty in the different problems given in the Woody tests is much wider than it is in the Courtis tests. The uniformity of difficulty is about the same, as I have found in applying the two tests. For this reason the children in the third grade, for instance, can be compared with the children in the eighth grade very well, and one of the advantages that I have found in applying these tests is to awaken the teachers of the eighth grade to the fact that it is important that they have daily drill on the fundamental processes.

There is a tendency on the part of teachers to assume that all the drill work should be done back in the fourth grade and that there is no need of drill in the eighth grade, but when I found children in the third grade solving more problems correctly than I found true for some of the children in the eighth grade, it wasn't much trouble to awaken that teacher to the importance of drill work in the eighth grade.

The 5A grade solved 79 of the 88 problems given in the Woody tests correctly. There were only 3 other divisions out of the 11 rooms which took the test who equaled this record. The problems were distributed about equally among the four fundamental processes: subtraction, addition, multiplication, and division.

Another thing that I found to my surprise in applying the Woody test was that some of the simple problems were missed by children in almost every grade. Take, for instance, the fraction 1/3 plus 1/3. Many children gave the result as 2/6. They simply added the numerators and the denominators. I found errors in their conception of what it meant to add fractions, and, not only that, but a number of other things were revealed by those simple problems. They were so simple that they were difficult, and they revealed their ignorance of method. I took time to give the gleanings that I got from grading those papers and distributed those thruout the school.

There is one other test that I put on. It wasn't an arithmetic test, but I found it revealed some facts that were decidedly worth while. It was Hartwell geography test, involving the location of places. There were 80 cities in that test. I found that children in the eighth grade couldn't locate more than 4 or 5 out of the entire list, and most of them were capitals of states of the Union. I found that on an average the children from the fifth grade up could locate only 30 of the 80 on the average, and that was a revelation decidedly worth while. I am sorry I haven't time to tell more of what was done.

MR. BOOK: What was your idea, Mr. Webb, in making a careful study of the character of the mistakes you found in the returns from your test?

MR. WEBB: I found that many times children are making mistakes because of ignorance of methods. I found that a teacher must do as Dr. Judd said yesterday, i.e. make a study of the individual's need, find where the squeak is, and put the oil there.

Many times pupils know better than they execute, but often they make mistakes because they don't know how to proceed. It may be from careless habits, but almost always it is from the fact that they don't know any better. Those careless habits may be in their morals, as well as in their ideas of the principles that are being applied in the solving of problems. If we can find out where the difficulty is, it is little trouble to straighten things out, but many times teachers will pass over those difficulties and never find them out because of mass teaching in place of individual instruction.

If you can get the data before you of 500 or 600 pupils, as I have done, and go thru their work and find where their difficulty lies, it isn't very much trouble to save time in the teaching of all the different grades of the schools. But unless you find this out a great deal of time will be wasted, and a great deal of time will be spent in mass teaching which is useless because the pupils are groping in the dark and do not understand what they are doing or where they are going.

MR. FITZGIBBON: I wonder whether the geography test is an indication of efficient knowledge about geography.

MR. SMITH: I should think it could be, altho locational geography is a very small part of geography work.

MR. WEBB: There is an amount of general information which every child should have; they should know where Chicago is.

MR. FITZGIBBON: Probably, but Montana wouldn't be of any importance to most of us.

MR. WEBB: No, but they should know where Louisville, Indianapolis, and Chicago are, and children generally should know where Chicago is.

MR. FAGAN: I have one question I'd like to ask Mr. Webb. He speaks against mass teaching, and emphasizes individual instruction. We will all agree, but I am wondering whether he knows of any school where the children are taught in arithmetic to distinguish clearly between what is given and what is to be found, and where they are taught to distinguish clearly the process to be used. It seems to me this is a serious trouble with most of our teaching in arithmetic. Our children do not know what is given, they do not know what is to be found, they do not know the process, and they have to be taught along these lines if we are going to get valuable results.

MR. WEBB: I might answer by saying that I have done just this thing. I have even gone farther and had them conclude what the result was. Such an outline as you spoke of has been given to every teacher in the Franklin schools.

MR. BOOK: That is the very point I wanted to bring out. It is one thing, a very important thing, to measure your achievement, to find out by the application of a reliable scale that we have or have not made the progress we think we should be making. It is an additional thing to find out what the trouble is about and how to remedy it. I wanted to emphasize the point that Professor Judd made here this morning in connection with reading when he made a plea for diagnosing the case. We must find out how that particular subject is learned, and what the specific difficulties are which confront the learner at different stages of the learning. We must determine how to meet them successfully.

A number of other studies have been made. Will you state, Mr. Giles, very briefly, what you have done at Richmond in addition to the work you did in coöperation with the Bureau?

MR. GILES: One of the investigations we carried on during the year was a study of the kindergarten instruction in Richmond; how it compared with that given in other cities, or squared with the modern theory of kindergarten teaching. We also wanted to know how we were connecting up the kindergarten instruction with the first grade work, whether or not we were bridging that gap properly. So we asked Dr. Judd to send us someone to do this work. He sent Miss Temple of the School of Education to make a survey of our kindergarten work. She spent two weeks in Richmond. I haven't time and it isn't the purpose here, of course, to tell you about the results of that survey. The report has just been received and we are going over it. We find it very valuable for us, not only for the kindergarten, but for the primary teacher as well, and we hope to get a constructive program out of that report. The report will be published by the University of Chicago and will be available at a later date. If you have any kindergarten work in your school I am sure you will be interested in it.

Another investigation we made was on the handwriting situation in the Richmond schools, which we undertook with a definite purpose in view. We have employed this year for part-time work a supervisor of writing. We were anxious to find whether it would pay to do this thing, whether the money that we are spending for a writing supervisor was well spent. So early in the fall semester we measured up the handwriting with the Ayres scale. It doesn't take very long, as you know, and I collected the papers gotten under uniform conditions from the teachers themselves who scored the speed of the writing. I had previously placed a code letter indicating the building and the grade on each one of the samples of handwriting, so that no teacher knew what building or grade she was scoring.

In about an hour we had scored all of the papers for the fourth, fifth, and sixth grades. These results were then tabulated. We also had a scoring period in the present term and did exactly the same thing again. I am sorry I haven't the results of this comparison to give you. The papers are just now being scored and tabulated. That is, the tabulation is being made for this semester in the office, but you will see readily that we had a definite purpose in mind. We will be able to tell, when this tabulation is completed, just what it is costing us in the way of supervision for a certain amount of improvement.

MR. BOOK: Is there anyone else who has been carrying on an investigation that would care to state to the conference the character of the work which he has undertaken? I know that a great many different studies were started and work done along lines discussed here at previous conferences. If anyone else has a piece of work to report on we would be glad to have you report it to members of this conference. We believe it is valuable to have a free round table discussion of all the scientific work that is being done in the state. We should keep in touch with what the other fellow is doing.

MR. FITZGIBBON: I don't know whether this would be dignified as a research problem or not, but a committee of our teachers study very carefully the report of the Indiana Commission on Feeble-Mindedness. Then I discussed that report with the whole body of teachers thru two or three meetings.

MR. BOOK: That is a very interesting and important topic, which we must take up very soon in this state. I want to discuss very briefly in a moment what I believe the next important step should be in the scientific study of educational problems. I feel that one of the most important things which we should accomplish by these conferences and by the studies we are making is to learn to study all our problems scientifically and to apply scientific methods to every phase of our work. One of the most important fields certainly is the one to which Mr. Fitzgibbon alludes. Does anyone else wish to give a brief report of work done in his city during the year?

MR. DU SHANE: You mentioned Madison a moment ago. I haven't any formal report to make, but we do daily work in arithmetic. We gave the Courtis tests in arithmetic from the fifth grade to the eighth, inclusive, last February. We repeated these tests in April. After we had given the first tests we arranged a systematic plan of drill work in the four fundamental operations in one of the buildings where they had the fifth and the first half of the sixth grades. In another building we did no systematic drill work. We also did drill work in the seventh and eighth grades. At the beginning of this month [April] we gave the test again to all the students to test the effect of the drill in the fundamental operations.

I haven't the report entirely tabulated, but can say that it proved to us that giving a definite time, say five minutes, to drill each day was of value at least so far as the median score of the entire class was concerned. It raised this considerably. We are just working over the results and I am finding many interesting things. I find, for example, that many of the pupils made a good gain. I find also that some of those who had the systematic drill made practically no gain at all, some of them even lost. A great many didn't do as well on the second examination as they did on the first. I think we are going to get a great deal of interesting material which will be of help to us in deciding how much drill work to do. I feel that this sort of work is a good thing. It gets the teachers interested in their problems. We are beginning to discuss more intelligently methods of teaching arithmetic, as was brought out by Superintendent Fagan a moment ago. As a result of one study some bulletins were issued to the teachers, asking them to give definite instructions to their pupils (1) on the statement of the problems to help them to see what was given, (2) on what they wanted to find out, and (3) on what process was to be used. We hope to get many more results from the work that we did.

MR. BOOK: I know that there are a number of other places in the state where work similar to that reported upon has been done, but we won't have time to have reports from all. I think in closing that it would be in place if I should make a few suggestions in regard to new problems or lines of work which we should be considering.

I think there are two lines of work that can and should be done. One line of investigation falls more directly on the people who are specially trained in our universities. Such investigations as are undertaken in child study and all problems in that field—child physiology, genetic psychology, child hygiene, and problems in the psychology of learning. There are still some of us who believe that a very important problem in all this work is to find out how children actually learn to read, spell, etc. Take reading or writing. We need to know how the learning actually takes place as well as to measure the progress a child makes in the learning. Measuring the rate and amount of improvement made should go hand in hand with an analysis of the learning process. We need to perfect all our scales for measuring the progress made in learning for reasons that have already been suggested in this conference. They are not perfect; they are the best that we have been able to work out up to the present time and these crude methods of measuring the progress made are far better than mere opinion, as is being demonstrated in nearly every field. We need to perfect these scales for measuring school achievements; we need also to measure and to perfect scales for measuring general intelligence and the special capacities and abilities of children with a view to being more helpful to them, and with a view to directing them more wisely in matters of vocational training and direction. But we need also to determine (1) how these subjects are actually learned, what habits are formed, what functions or abilities acquired; (2) how these habits are acquired in the learning act, and (3) we should determine the difficulties which are encountered in the process of acquisition involved and the factors and conditions which help or retard the learning itself.

A second group of problems can be worked at most advantageously by the coöperation of the school men with the men and women at the University who have the resources of a university behind them and who have leisure time and perhaps a little better training for the careful work that should be done. I want in closing to call your attention to a few of the more important lines of research that should be taken up coöperatively by these two groups of men and women.

1. The first, of course, is the group of problems that we have taken up in this Bureau, measuring school achievement and testing the efficiency of the work done in the instrumental subjects: reading, writing, composition, and the rest.

2. A second line of work that has scarcely been taken up at all, and which I think will have to be worked at scientifically soon, lies in the field of selecting and evaluating the work of teachers and assigning them to the work which they can do best.

In February there was held at Indianapolis a conference of employing managers in large industrial concerns. The problems that they were discussing were: how to select foremen for the different lines of work in stores and industrial concerns; how to take a given body of men and women and place them in the positions where they would render to the concern the greatest amount of service; how to train them on the job. In other words, it was a discussion of the problems of the employing managers. It was a meeting of the men who employ men and women to work in commercial and industrial establishments, and their discussions showed how these men were actually applying scientific method to the solution of all their problems. On the fifth and sixth of this month [April, 1917] a national conference of these employing managers was held in Philadelphia, where the same line of problems was discussed.

Now, here, it seems to me, is a suggestion for a field of work that is tremendously significant and of first importance for superintendents and high school principals, because, as we all know and have always known, the most important single factor in any school system is an efficient teacher. Can you select them? Can you place them where they will do the best work? Can you keep them in good humor and working at their best? Here is a whole group of problems that we haven't touched at all, and I don't know of any place where we could get better suggestions for the study of this group of problems than from these employing managers' conferences, where we may see how they have worked scientifically at the problem of selecting and training efficient workers.

3. Another group of problems that might be worked at coöperatively is studies and experiments designed to improve teachers while in service. I mentioned some of the results which had been obtained along this line in Frankfort, where superintendent and teachers made scientific studies, surveys, etc. Such work can be taken up coöperatively by any superintendent and his teachers working with one or more men at the University.

4. A fourth line of work that might be taken up is testing various methods of teaching instruction. We haven't done very much in this line. Testing the effects of various methods of instruction might be carried along coöperatively with this matter of measuring the results of learning or school achievement, to which it is very closely related. I have in mind the kind of thing that has been done so extensively and successfully in Germany under the name of "Experimental Didactik".

5. Another line is applying scales for measuring the intelligence and specific abilities of children so that they can be properly grouped in school. We are at present governed largely by opinion. We fail to deal with pupils according to their abilities or real needs. It is my opinion that we should connect up all our tests for school achievement and all our methods of teaching and study of learning much more closely with the matter of intelligence testing than we have ever done if we would get the most efficient results. In all these matters we must take more account of an individual's general ability or power to use all the knowledge and information that he has attained, bringing all his resources to bear upon any particular task placed before him, whether this be learning, playing baseball, or what not.

6. Lastly, it would be well if we should frequently stop to inquire how we stand in Indiana with regard to the following principles, which should be followed by all school officials in the organization and conduct of their schools:

(1) Do we have a clear conception of the exact purpose for which the school exists, and the specific work that is to be done? If not, we may be moving south when we ought to be going north, or traveling in a circle instead of moving straight towards our goal.

(2) Do we have a clear distinction in our own minds between the functions of the board of education and its staff? In other words, is there a proper differentiation between them in actual practice? The situation in this regard in Indiana is anything but ideal, and we should do something to correct it. I think the situation with regard to the proper function of the school board and the staff of people who ought to be experts, whom they hire to manage the school and to be responsible to them for the same, is worse than it was when I began to teach a good many years ago. At any rate, we have some evidences that it hasn't improved as it should. What can we and should we do about it?

(3) Do we have and can you get a competent staff of employes for the different lines of educational activities and business affairs of your

school? Can you select and test the efficiency of these workers in an accurate manner? If not we should apply scientific method to this group of problems in the same way as it is being applied to similar groups of problems by the employing managers of large business concerns.

(4) Is there complete accountability of the general manager, the superintendent, and thru him, of the staff of the school, to the board? Is the accountability based on fact instead of opinion?

(5) Is there coöperation under the leadership of the school between the school and other agencies of the community which are seeking to accomplish the same results?

(6) Are we organized so that there may be made at stated or definite intervals a thoro self-examination of the results actually achieved by the school, measured in objective terms by members of the staff, so that mere educational opinion *without* and *within* the school may be confirmed or refuted?

(7) Some school systems have established bureaus of efficiency or research to handle this phase of the school work. They employ an expert, who checks up the school work done and makes studies, giving to the superintendent and teachers the data needed to make helpful comparisons of every sort. In other cities all this work must be done, if at all, by superintendent and teachers. Are we sufficiently trained for this part of our work? If not, how can we best fit ourselves for this important duty?

(8) I have said nothing about a very important and extensive line of research that has been carried on by the Indiana State Board of Education during the year, studies which were designed to help us solve some of the problems which grow out of our attempts to provide real vocational training for all our young men and women and for the adults who are ambitious to make themselves more proficient in their chosen occupations. This is perhaps the most important step in research that has ever been taken by any state and has attracted the attention of the nation. It is doubly important because it shows that Indiana believes that in all important educational undertakings we should first determine the facts that are needed to enable us wisely to decide what we should do.

You see, I hope, more clearly what is needed in all our educational work. We must learn how to apply scientific method to all our problems, learn to check up our work in ways which will show us exactly where we stand. In this respect I think the situation in Indiana is very encouraging. The fact that more than one hundred superintendents and principals will each year come to the University for a conference on educational measurements, and will during the year engage in scientific studies undertaken to help them in their work and to make them more efficient in applying scientific method to their work, is proof that the educational situation in Indiana is in a very healthy condition. I congratulate you on the work you are doing and hope each one has gotten new inspiration and courage from our meetings for attacking new problems and lines of work which will make our educational efforts still more effective in the future than they have ever been before

The Determination of Standards in Vocational Education

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THE problem of devising standards for measuring the efficiency of vocational education is identical to that of devising measures for general education. One problem is just as definite as the other, and the needs for measures in both fields are equally urgent. In general education the measure is a test of accomplishment of specific tasks: the number of words spelled correctly; the number of problems in arithmetic solved correctly in a given time; the mastery of thought and ideas of written expressions; or the legibility and speed of handwriting. In vocational education, likewise, the measure must be a test of accomplishment: the speed and efficiency of the young surgeon in performing a certain operation; the successful preparation of a meal in a given time with given materials and equipment; the plastering of a room; or the successful operation of a knitting machine. To date, propaganda work has occupied the attention of the majority of those interested in vocational education and few measures of the efficiency of instruction in any vocational field have been devised for the professions, agriculture, industry, commerce, household service, or public service.

It is obvious that the success of the movement for vocational instruction depends upon those trained in vocational schools having a fund of general and special knowledge, being in possession of certain skills, and being sufficiently adaptable to enable them to perform certain particular tasks the sum of which constitute occupational efficiency.

The first question, then, which must be answered for all vocations for which training is proposed is, What constitutes occupational efficiency? It would seem, at first thought, that this could be very easily determined by merely finding out the standards set up and required for the various professions, for industry, agriculture, etc. But the difficulty lies in the fact that even old and long practiced occupations have erected no such standards for entrance to, or proficiency in, the respective lines of profitable employment. By way of illustration, the medical profession has no set of standards indicating measures of success or failure for doctors in ordinary practice which serve to determine whether the practitioner should remain in the profession or be excluded. The only bars from the profession now are evil intention or gross carelessness. The physician may incorrectly diagnose one-half of his cases and still be rated as successful. In the field of industry standards are (with few exceptions) no more definite. Of fifteen girls working side by side stitching butter boxes on wire stitching machines, three may complete 100 per hour; ten from 100 to 200, and two more than 200. All may receive the same wage and be rated as equally successful. The work of lathing furnishes another illustration. When the apprentice can lay 1,400 laths a day he is rated as a journeyman, but among successful lathers some lay 1,400, some 1,600, and some as many as 1,800. They are all rated as successful and belong to the same union and sometimes receive the same wage.

In all phases of agricultural production, no attempt has been made to erect standards of any kind, except in a general way; for instance, one who raises 100 bushels of corn per acre is rated as very successful, but there are no standards for the permissive mortality of pigs, chickens, and mules for this successful agriculturist.

Even in the ancient and honorable field of teaching there are few standards by which a superintendent may measure the success or failure of members of his teaching staff.

In general, therefore, the occupations themselves have no very tangible standards of accomplishment which may serve as guides in devising courses in vocational schools and in determining when accomplishments of students meet the requirements of the working world. The vocational survey, of which occupational analysis is an important part, is a means which has been developed for determining standards of occupational efficiency required in the working world. This device is not new. The first occupational survey in this country was made in 1724 and represents a wonderfully interesting combination of patriotic appeal and occupational analysis. It was published by Francis Rawle and is entitled, "Ways and Means for the Inhabitants of Delaware to Become Rich". Part of the Introduction follows:

> "As Trade is a noble subject most copious, so it deserves a better Genius and capacity than I am master of, to discourse on the several branches thereof.
>
> "But some ingenious and well meaning Persons having employ'd their Pens that way, from the generous Motives and views of promoting the public Good, I persuade myself 'tis a good Omen and Presage of the future Happiness of a Country, especially when it appears in private Persons, who for the most part may be presum'd to be free from the Byass of sinister Interest; whereas publick Projectors, under the specious Pretenses of Publick Spiritedness and Promotion of Trade, secretly carry on their private Interest, without any true regard of the Publick, and which they too often sacrifice to the great Damage if not Ruin thereof."

After describing at length many opportunities for industrial development, Rawle writes the following about the possibilities of paper making:

> "Paper: Another manufacture is what we have faln into of late years, and in Time may be improved equal to Dutch & French Paper, and is chiefly Labour, which saves us the costs to be laid out and otherways, as observ'd in other cases and employes some poor People to find a living by gathering Rags which would otherwise be lost."

At a little later date the following occupational description of paper making was printed:

> "The Germantown of which I spoke before,
> Which is, at least, in length one mile or more,
> Where lives High German People and Low Dutch,
> Whose trade in weaving linen Cloth is much.

There grows the flax, as also you may know,
That from the same they do divide the Tow;
Their trade fits well within their habitation,
We find convenience for their occasion.
One trade brings in imployment for another,
So that we may suppose each trade a Brother;
From Linen Rags good paper doth derive,
The first trade keeps the second trade alive;
Without the first the second cannot be,
Therefore since these two can so well agree,
Convenience doth appear to place them nigh,
One in Germantown, T'other hard by.
A paper mill near Germantown doth stand,
So that the Flax, which first springs from the land,
First Flax, then Yarn, and then they must begin,
To weave the same, which they took pains to spin.
Also, when on our backs it is well worn,
Some of the same remains Ragged and Torn;
Then of our Rags our Paper is made,
Which in process of time doth waste and fade;
So what comes from the Earth, appeareth plain,
The same in Time, returns to Earth again."

The following description of the work of the ragpicker at Brittany, published early in the eighteenth century, is further evidence that interest in occupational analysis is not new:

"In Brittany, he is a cross between a wandering Jew and a gypsy; he leaves his family in some mountain den in search of rags; goes from farm to farm and castle to cottage. To the rich, his visits appear almost as insults. If he knocks at the door of some well-to-do farmer, 'Go elsewhere,' says the master, 'we have no rags here.' 'Ah, well I'll come another day' replies the pillawer, with a glance of malice forboding; and he passes on for the time, sure of finding poverty and rags at no great distance. But even in the poor man's cottage he never sets foot; he waits at the threshold while the rags are brought to him and the bargaining is made outside the house. No seat in the chimney corner nor even a cup of cider, is offered the ill-omened trader in misery."

Emile Souvestre, in *Barzaz Breiz Deniers Bretons*, describes him in the poetry of an old Breton ballad:

"Rude is the life of the pillawer;
He tramps through the deep roads, with no shelter from the rain, but the overhanging roots. His fare is the manchet of black bread and he drinks from the mere where the frogs croak.

"He sets out, this pillawer; he descends the mountain;
His path lies among the poor of the earth. He leaves behind him wife and children to return after long months. Perhaps no more.

"Onward goes the pillawer, onward still, like the wandering Jew; he has none to love him; no kin, no friends to greet him in the low lands; men close their door when they see him for he passes among them for a man without faith.

"Sundays and fete days, he is ever on the road; he hears no mass nor office; he is never seen to pray at the grace of his father or mother; he confesses not to priest; the lowlanders say that the pillawer has neither parish nor creed.

"Foul with dirt are the rags which the lean horse drags along, but the running water shall one day wash them clean; the rending wheels shall grind them and they shall come forth as paper, fairer than white lawn.

"So with thee, poor pillawer; one day thou wilt leave thy corpse and tattered rags in the roadside ditch, but thy soul will fly forth white and fair, and the angels will bear it away to Paradise."

Since these early descriptions were printed, and, particularly during the last ten years, many occupations have been described in more or less detail so that now such descriptions are available for over four hundred profitable pursuits.

The majority of these studies are in the field of industry, but even in this field the data are still quite inadequate and incomplete. For example, during the last three years phases of the printing trades have been analyzed in great detail in Richmond (Va.), Cincinnati, New York City, Minneapolis, Cleveland, Indianapolis, Evansville, and Richmond (Ind.); they have been partly analyzed at least six more times, not including a score or more minor analyses to which they have been subjected. In spite of all the work and expense, estimated to have been at least $20,000, we have as yet no clear picture of all phases of the printing trades. We have no descriptions of city or rural newspaper shops, small job shops, or any of the art processes, or any of the business and managerial phases of the industry. In other words, the sum of all the twenty-five or more surveys of this trade thus far made does not constitute a complete picture of this industry. This field is cited as being typical of all. These inadequacies are due to two reasons: first, the adoption of the community unit for the study; and secondly, the lack of standards, forms, and methods of study for occupational analysis. For complete occupational pictures, the basis of approach must be the industry rather than the community, for in no one community are all the phases of the occupation to be found. For example, the automobile industry cannot be thoroly studied alone in Indianapolis, but requires studies in Detroit, South Bend, Kokomo, Richmond, Muncie, and Anderson. Likewise, the piano industry cannot be adequately studied in Richmond, Ind., as large shares of the industry are carried on in Newcastle and Hammond, and the agricultural implement industry is not inclusive in Evansville, Columbus, or Richmond.

The need for standard forms and methods of procedure is very great. Without such forms comparisons are impossible. It would seem, after careful study of all occupational reports printed, and after some participation in work of this sort, that the following sequence of topics and questions would constitute a form suitable for universal use in all types of occupational analysis, including the professions, agriculture, industry, household arts, and public service.

ANALYSIS OF OCCUPATIONS

1. What the worker does—
    General description of work.
    Materials handled.

Machines; names; set up; operate; repairs (adjust).
Range of work.
Receiving orders, reporting work done.

2. Mental and physical requirements—
   Height, weight, strength, discrimination (ability).
3. General knowledge required for entrance, for efficiency, for promotion—
   General education desired.
   Elementary school; high school.
4. Common deficiencies of workers—
   Education and personal.
5. Special knowledge required.
6. Skill required.
   How much prerequisite technical education.
7. Can special knowledge or skill be obtained on job?
   By specific instruction.
   Period of learning.
8. Promotion—
   Lines of promotion.
   Factors conditioning promotion.
   Experience, education, personality.
9. Source of workers—
   By promoting employees.
   Advertising.
   From other establishments.
   Direct application.
   Personal recommendations.
10. Method of selection—
    Interview, test, trial, examination.
11. Seasonableness of overtime—
    Number of weeks idle.
    When summer half-holiday.
    Number of hours overtime.
    When payment.
    Vacation period: payment.
    Extra help: when needed.
12. Working conditions—
    Sit or stand.
    Dangers from machines.
    Temperature and ventilation.
    Dangers from gas.
    Space-sanitation.
    Peculiar strains: physical and mental.
    Light conditions: artificial and day.
13. Wages and earnings.

By this method of procedure the actual requirements of occupations may be obtained, and, having obtained a complete list of particulars of requirements for occupations for which training is proposed, the next step is to devise standard courses of instruction. There are no inherent difficulties or reasons why most vocational courses should not be standardized as to duration, course content, and organization, and methods of instruction. Variations will result, not from the differing content of courses, but from individual differences in aptitudes and capacities of students and the abilities of the teachers.

Standardization must also become effective in vocational school plants, and equipments, not only in tools and rooms but in library and reading-room facilities. The variation in equipment is most surprising. Machine shop instruction is conducted in rooms with equipments varying in costs from $200 to $20,000, and schools of education for the vocational preparation for teaching are supported on budgets ranging from $10,000 to over $500,000. With a very definite task such as the training of a machinist, or the training of a teacher, it is unreasonable that there should be great differences in equipment and upkeep costs per capita, for the respective fields.

Standardization is also vitally needed in measuring the training and experience and teaching ability of the vocational teachers. The current practice is to employ vocational teachers from among those who are rated as successful in their vocation. For example in the field of industry teachers are chosen from among journeyman workmen. In industry, the term journeyman now conveys no real meaning, for a journeyman carpenter may know practically nothing of carpentry from the all-round trade point of view, and a journeyman plumber may merely know how to assemble units of plumbing fixtures received from the factory. Also, in commerce, the bookkeeper who is rated as successful, who may be chosen as a vocational teacher, might know only the one system of bookkeeping followed in his establishment. Therefore, in selecting vocational teachers we must standardize requirements of practical experience, listing all phases which are necessary for adequately teaching the course which is outlined.

Summarizing the lines in which standards in vocational education must be derived: first, the detailed requirements of the occupation must be determined; secondly, standard courses must be prepared; thirdly, standards for measuring accomplishments must be formulated; lastly, there must be standards for the selection of teachers and measuring the efficiency of their instruction.

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Fifth Conference on Educational Measurements

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FIFTH ANNUAL CONFERENCE

ON

EDUCATIONAL MEASUREMENTS

Held at Indiana University, Bloomington, Ind.,
Friday and Saturday, April 19 and 20, 1918

PUBLISHED BY
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1918

high command back of the battle lines is calm and serious and thoughtful and careful and studious, and that is what it is necessary for us to be. It is, therefore, well indeed that many of the best school men and school women of the state of Indiana should come together here, far back of the battle line, to study fundamental educational facts and conditions. We should realize that in doing this in the quietness of this place we are doing something which is worth while with reference to the winning of the war and with reference to the preservation of our nation and of democracy thruout the world.

Address of Chairman

ROBERT W. HIMELICK, Superintendent of Schools at Ft. Wayne

I BELIEVE there is no gathering of school men that is more significant in an educational way than the one which has assembled here today; a gathering where the educational problems, and educational measurements especially, are to be considered. Of course this is a popular subject in some ways. There are many things we want to do. And while I suppose in the near future we shall look before we leap and think why we do the things in the way we do them, yet there are those who are willing to take some of these first steps, do the experimental work as it were.

I believe that the educational measurements will take care of the educational surveys. Surveys are in a sense educational measurements and as such they did something that was worth while. So it is with the educational measurements being conducted today. While we are going to try to measure some things that are not capable of being measured, we shall discover some things that will be worth while in solving some of the problems which are perplexing today.

A few years ago, the more practical men in school work said that you could not in any way measure the influence of one individual upon another. Some say the teacher is the most important factor in school and, therefore, you can't measure her influence upon the pupil. That is something we are not at all certain about. We may be able in the future to determine just the extent of the influence of teacher upon pupil.

The Problem of Selecting and Training Gifted Children in the Public Schools

GUY M. WHIPPLE, Professor of Educational Psychology, University of Illinois

FOR various reasons most of the scientific study of unusual children has been limited to the subnormal. Particularly during the past decade has the study of backward and feeble-minded children been most actively prosecuted, with the result, as my hearers know, that we now have a well-developed psychology of feeble-mindedness and a flourishing pedagogy of the subnormal, with a tolerably wide-spread belief in the necessity and usefulness of special classes in the public schools for the handling of pedagogically retarded and mentally deficient children. One reason why this activity has been directed toward the problems of the subnormal rather than toward those of the supernormal is, I think, that the subnormal child offers a more obvious disciplinary and administrative problem in the school. Another reason is that the mentally insufficient child particularly enlists our sympathy, and that our interest, our effort, and even our money go out more naturally to help the weak than to assist the strong. Nevertheless, I am myself convinced that it is precisely the gifted pupil that is often most pathetically retarded and most richly deserving of our sympathy. Too often these children are found working far below the level of their latent abilities, their development checked if not actually damaged, both because they are unnaturally restrained in their progress thru the school grades and because they are permitted to form habits of slack and half-hearted activity that are hard to break in later years. And so I am convinced, with Stern, that "systematic pedagogical measures, if applied to hundreds of supernormal children, might, under favorable conditions, bear more abundant fruit, both for the individual and for society, than does the ten times greater expenditure of energy that is now devoted to thousands of subnormal children." It is my contention that for its own best interests, society ought to inventory the talents of its members, that our school organization ought to be placed on a psychological basis, so that pupils of like psychological attainments could be instructed in homogeneous groups and reasonable individualization of pedagogical treatment could be secured, and that further steps ought to be taken to bring about, by a carefully developed system of patronage, the fullest development of children of superior ability and promise.

If the general doctrine that I have enunciated be admitted, then I want to show that in any attempt to work out the details of its application to the concrete conditions of daily life we are confronted with a series of questions, the answers to which are not always to be found ready at hand.

Since these specific questions bear upon the general problem of selecting and training gifted children in the public schools, I venture to set them before you, even tho I cannot undertake to answer them all.

1. First, what is the relative part played by heredity on the one hand and by environment on the other hand in the production of individuals of superior achievement, whether this superiority be general and all-round, or specific and limited to a particular talent?

It is perhaps impossible to answer a question of this sort in precise quantitative terms, but I am sure all the evidence before us shows that superior achievement demands the combination of the two factors. But because the hereditary endowment is the fundamental prerequisite, we need to locate at an early age those pupils whose original endowment of brains is of the highest order and then see to it that the educational environment of these children is arranged in the way that favors to the utmost the development of this original endowment.

2. How early in a child's life can the possession of this superior kind of original endowment be determined?

We need further study of this question, but I am sure that we may proceed to a provisional measurement certainly as soon as the children enter the public school system.

3. What physical or what mental traits afford reliable criteria of superior ability and how may these be detected or measured with precision?

This I shall touch upon later, and we shall make it the subject of discussion in the conference this afternoon.

4. How can we discover and foster in the school, superior original endowment that is specialized, that appears in musical, artistic, dramatic, literary, linguistic, mechanical, mathematical, administrative, inventive, scientific, and other lines?

Psychologists have but begun to scratch the surface of this interesting field, and further investigation is, in my way of thinking, uncommonly difficult, so that I fear that the day of vocational guidance by mental tests is not so near as many would have us believe.

5. What sort of interrelationships—reciprocities or antagonisms—exist, or may exist, between these specialized forms of ability?

This is a matter for future investigation.

6. Can we surely distinguish real superiority that will fulfil its promise? Especially, can we distinguish it from the sort of pseudo-superiority which is mere precocity and which eventually attains nothing more than a commonplace mediocrity?

This is perhaps the question most often asked. I am sure that we can detect by mental tests differences between the real ability that we seek and at least some kinds of seeming ability that are often mistaken by parents and teachers for the genuine article. Thus, to take an instance, possession of a "sticky" memory will cause many children to achieve striking results in the direction of high marks in the classroom; but the lack of resourcefulness, initiative, and capacity to solve new situations successfully that produces the mediocrity of this type of child when faced with real situations of daily life is readily brought out by suitable mental tests.

7. Ought gifted children to begin their training, especially their formal school training, at an earlier age than usual, or ought they, perhaps, to be held back from such work until they are, say, eight years old or more?

It is evident that the half-dozen or more children whose attainments have been so extraordinary as to make their names common household words—I refer to the Berle children, Norbert Wiener, William James Sidis, Winifred Stoner, and others—that these children all began their formal education virtually in their babyhood. All of them, I believe, could read fluently at the age of three. On the other hand, these are not the children that we must keep in our minds when we speak of gifted children in the public schools. These extraordinary children undoubtedly possessed a quite uncommonly superior endowment of ability, and they all of them received a course of training at the hands of their parents which would be quite impossible in the average American home, to say nothing of the average American school. Moreover, those who cherish a certain reluctance to the early entrance of pupils upon their school work can find numerous instances of gifted children who have begun their work late and seemingly suffered nothing thereby. Professor Terman told me recently of a California lad who went thru eight grades in three years and a half, the first three of them in one year. Of course he had made some beginning at home. In general, I feel that the answer to this question must be, "It depends." It depends on the qualifications of the individual child, on the possibilities for home instruction, and upon the kind of school system, particularly upon the flexibility of promotion in the school system, to which the child has access.

8. Can the legitimate demands of the education of gifted children be met best by segregation into special sections or classes? Is there any other administrative device—like grade skipping, individual promotion, semiannual promotion, promotion by subject—that will be better or even as good?

In my judgment, any one of these devices that facilitates the progress of the gifted pupil is better than none at all, but segregation is the one best device; the others are partial and makeshift substitutes for what is really needed—the assembling in one group of pupils of like mental attainments and the application to this group of the methods of instruction and rate of progress in subject-matter that is best fitted to it.

9. Are special classes for gifted pupils more important or less important than special classes for dull and feeble-minded pupils?

I admit that from the point of view of the pupils who are left in the regular classes and also of their teachers, the taking from the classroom of the stupid pupils probably accomplishes the greater relief, tho even this might be a matter of debate. But I am equally positive that from the point of view of the pupils who are removed from the regular rooms, the investment repays many fold better in the special classes for the gifted. It is a serious question just what permanent good actually results from the instruction given in special classes for subnormal children as now commonly organized and maintained in our public schools. It is not my business to argue that matter here, but I believe that some of you will indorse my assertion. On the other hand, as I have maintained already, the permanent results attained from a properly organized special class for gifted pupils are many and of the utmost signficance, pedagogically and sociologically. Were I a superintendent of schools, I would, then, at least start one class for gifted children whenever I started a class for stupid children, and I am not sure that I wouldn't start the gifted class first.

10. How many children ought to be drawn off to make up a special class for gifted pupils?

The experience of several school men who have been keenly interested in the possibilities of special training for superior children appears to coincide here and to warrant the belief that in the ordinary school population, ten pupils in every hundred are sufficiently gifted to make it possible for them, without undue expenditure of time in home study, without strain, and without detriment to their physical or mental health, to accomplish in one year, two years of the elementary school curriculum as now organized in American public schools. I would submit this as a useful working definition of the gifted child. Translated into terms of mental efficiency as measured by the well-known Binet-Simon tests, this means that children whose intelligence quotient amounts to 115 or better may be termed "gifted". Experience may show that the line may be drawn to include even more pupils, or it may be found desirable to set the limit still higher. Thus, I have some evidence to show that pupils whose intelligence quotient is 110 or better (the top 20 per cent of the school population) may succeed in accomplishing two years' work in one, provided they also be of sound physique and possessed of a tolerably good degree of zeal and industry. On the other hand, if conditions make it possible to segregate a group of pupils whose intelligence quotient is 120 or better (approximately the top six per cent of all pupils, whom Terman characterizes as possessed of "very superior intelligence") then, as the experience gained by the institution of such a class at Louisville, Ky., is showing, quite remarkable results can be achieved.

11. How early in the school grades can a special class for gifted children be organized to advantage?

In several cities so-called "preparatory centers" have been organized to handle pupils entering the seventh grade, usually with the idea of accomplishing three years' work in two years. The class at Urbana, which I shall describe in a moment, was composed of pupils entering the fifth and sixth grades. In one or more other cities special classes have been successful in the fourth grade. The formation of a rapid section of selected pupils has been successfully accomplished in the very first grade—witness the results obtained in New York City, as described by Martha Adler in the *Journal of Educational Psychology.** In principles, I see no reason why classes such as I am advocating may not be formed at any point in the school system in which administrative conditions suggest their establishment.

12. Ought pupils in special classes for the gifted to pursue the regular curriculum at a faster pace, or ought they to keep the general pace of the regular classes but extend their work to secure a more intensive and also a more extensive training?

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*Vol. 5: 22-28 (January, 1914).

We are not prepared to give a conclusive answer to this question, mainly because no one has carried on the experiment on a sufficiently elaborate scale to supply the necessary information. I am sure that if the instruction be confined to the regular material of the grade classes, then these special classes can proceed at approximately double the normal pace. But, assuming that a special class were organized in the first grade on this basis, then we would expect the pupils to complete the eight grades in four years, and it is hardly necessary to say that most school men would contend vigorously that ten-year-old pupils are totally unfitted to enter upon the work of the secondary school. I am ready to admit that ten-year-old pupils probably cannot enter high schools in conjunction with other pupils of fourteen years and upward and find themselves in a happy environment, but I am not at all sure that the difficulties they would encounter are primarily intellectual. I have a notion that such a class of gifted pupils as I am describing, if kept by itself, could undertake work in algebra, Latin, high-school English, and the like with pretty good success. I have a suspicion that we are prone to overestimate the differences between the subject-matter of the high school and that of the grades. I am inclined to think that there is nothing peculiarly different, qualitatively, between the study of these subjects and of those of the upper grades of the grammar school. I do admit, freely, that the organization and methods of instruction in the present high school are unfavorable for immature pupils. In fact, I have seen examples of the damaging effect upon pupils of the upper grammar grades of the introduction of departmentalized instruction and other features characteristic of secondary school work.

Leaving aside, then, as a debatable matter, the extent to which the taking of a faster pace thru the entire elementary school might injure the mental development of gifted pupils, we may note that, since in the classes I plead for there is bound to be much saving of time, there is at least abundant opportunity for enriching the work by extension. Here, again, we are ignorant of details. We do not know in detail just how much more comprehensive the instruction ought to be in such special classes.

13. We are led naturally to inquire next, In what way ought the teacher and the teaching, the methods of instruction—presentation of lessons, use of drills, recitations, etc.—to differ in special classes for the gifted?

In the experimental class that was organized under my direction at Urbana last year one of those commissioned to study its operation, Dr. T. S. Henry, now of the Kalamazoo (Mich.) State Normal School, paid almost daily visits for the purpose of answering the question just raised. I quote from his report the last fifteen of his eighteen conclusions and recommendations.

"(4) The teacher of a special room for gifted children must possess a large fund of general information.

"(5) The teacher must have had adequate foundation in the theory and practice of education.

"(6) The teacher must be characterized by energy, enthusiasm, and an inspiring personality.

"(7) The teacher in charge of a special room should be carried along with it in its advancement, and should remain with it as long as it retains its organization.

"(8) The special room should be equipped with movable desks and should be well supplied with maps, charts, globes, pictures, and other aids to study.

"(9) In the special room drill should be decreased by about fifty per cent.

"(10) Likewise, explanation should be reduced about fifty per cent in amount and needs to be given in much less detail than to ordinary pupils.

"(11) Emphasis should be placed upon the development of the pupils' initiative.

"(12) Much use should be made of the 'principle of application'. 'In carrying out this principle, pupils must be encouraged in all possible ways to make immediate and practical application of what they have learned, in the acquisition of new knowledge and in the other activities of the schoolroom. In particular, the teacher may often very advantageously make use of this principle in provision for review.'

"(13) Instruction should be as much as possible by broad, underlying principles, rather than by detached facts. This is an important principle in all teaching, but it can be realized to a much greater extent with bright children than with ordinary ones, and consequently needs to receive greater emphasis in their instruction.

"(14) An important feature of the teacher's method is the development of a proper perspective of the material of instruction.

"(15) The teacher of the special room for bright children need pay but little attention to discipline beyond seeing to it that the pupils have work enough to keep them busy.

"(16) If any of the pupils in the special room seem to be developing egotistic tendencies, the teacher should apply the 'social check'.

"Contrary to the impression entertained by some, segregation of superior children does not inevitably develop in them undemocratic ideas and attitudes. Quite the opposite, in fact, there is *more* opportunity for the development of the feeling of superiority on the part of the bright child in the regular room than in the special room. Under ordinary conditions, the bright child stands out conspicuously above his fellows; his superiority is acknowledged by them, often to the point of resentment, and he is keenly aware of it. When a question has gone around the rest of the class without receiving an answer, the teacher turns to him with an air of finality and relief. Such opportunity for display does not come to the child in the special room, for here he is among real competitors, and in place of being always in the lead he must often exert himself to keep up with the rest.

"(17) Corresponding to the special adaptations of method, there should be a readjustment of emphasis in subject-matter.

"(18) The teacher of a special room for gifted children should be allowed wide latitude in modifying the course of study to fit the purpose of the room and the needs of the pupils."

But I am reminded that this is a conference on educational measurements and that thus far my theme has not led me to discuss the use of measurement in selecting or training a class of gifted children. Let me, then, recur to the question I raised as to what physical or mental traits afford reliable criteria of superior mental endowment and how these traits may most satisfactorily be measured.

At the outset it will be profitable to remember that superiority of endowment may apparently be restricted to one or more talents or may be demonstrated in almost all aspects of mental activity. Children whose superior endowment is of the former type, who are the possessors of special talent, must for our present purposes be left out of account. We are dealing, then, with children whose mental superiority is of the general type, and we must assume, from what we know of psychology, that this general superiority is synonymous with a superior quantity of general intelligence. Our problem of selection becomes then: What is the best way to determine the general intelligence of groups of school children for the purpose of selecting a special group of extra good intelligence? It was to find by experiment an answer to this question that the General Education Board granted me in the fall of 1916 a sum of money.

With this appropriation in hand I was able to subsidize the work of two graduate students in education and to secure the services of a competent research assistant, Miss Coy, now teaching at Ohio State University, whose work it is in the main that forms the subject-matter of the remainder of this paper. I was also able to subsidize the labors of a special teacher in one of the elementary schools of Urbana and thus to make possible the establishment of an experimental room for gifted pupils.

The Leal School, in which the room was established, has a population of about four hundred pupils, comprising the first six grades, arranged in twelve rooms. The classroom that was given us for the special class was quite ordinary and received no special equipment, save that the Venetian blinds at the northerly windows were removed, the wall repainted in lighter tones, and the blackboards resurfaced to render their contents more legible. We had none of the luxuries of classroom equipment. The teacher, who had to be secured at the twelfth hour, was well fitted in training (she was a college graduate and a graduate of a well-known normal school and had had some two or three years of teaching experience) but she was poorly fitted in personality (she was slow of speech, slow of movement, lacking in initiative and at times seemingly in information). All in all, she may be considered an average teacher; and, in any event, what success we achieved cannot be discounted on the plea that only a skilful teacher could have accomplished it.

It had been originally assumed that the pupils would be selected for this room by a series of mental tests instituted by the psychologist. For reasons beyond our control the room actually opened in October, 1916, with a complement of pupils (fifteen in the fifth and fifteen in the sixth grade) that had been selected by the teachers and principal of the school mainly on the strength of their previous school marks, with some discussion of their health, and with consideration of the wishes of their parents. This incident was felt to be a calamity at first, but it proved a typical "blessing in disguise" because I was able to prove that the teachers had made mistakes in this selection and that these mistakes would have been avoided had the selection been conducted, as intended, by means of the mental tests.

As actually assembled, these thirty pupils, who will be referred to in what follows as the Special Group or as the Special Fifth and Special Sixth, represented about one-fifth of the pupils in the grades from which they were taken. The remainder of these two grades will be referred to as the Control Group or as the Control Fifth and the Control Sixth—

using the term "control" because we aimed to apply to these pupils a considerable number of the psychological and educational tests with which we measured the abilities and the school progress of the pupils in the Special Group.

It would be impossible to take the time even to enumerate here the tests that were used for this purpose; suffice to say that some thirty-five psychological tests and some twenty educational tests were applied. The psychological tests included (for the Special Group) a careful Binet examination with the aid of the Stanford Revision and several tests of each of the commonly named aspects of mental activity, like memory, reasoning, attention, etc.; the educational tests were adequate to measure with precision the work of the pupils in spelling, drawing, handwriting, arithmetic, and composition. In addition, we collected evidences of the ideals and ambitions of the pupils and also had their mental and moral traits rated by their teacher and three other persons who were observing them almost daily. All in all, I think it safe to assert that in few public school classes (or private school classes either) has there been gathered together so comprehensive and precise information about the mental, moral, and pedagogical qualifications of every pupil.

The important outcome of the whole experiment, so far as it concerns the study of methods of *selecting* pupils for a gifted class, centers evidently on this question: To what extent did the teachers' selection justify itself in the subsequent work of the pupils, and would a selection made by means of our mental tests have proved a better one?

We may begin our answer to this question by noting the outcome of the examination of the general intelligence of the pupils by the Binet tests. In the Special Fifth the I.Q. (intelligence quotient) ranged from 102 to 146, average 119; in the Special Sixth it ranged from 99 to 133, average 116. Now, as I have said before, the upper fifth of all children may be expected to attain an I.Q. of 110 or better. Since these pupils were selected by the teachers as the upper fifth of their grades, we would expect their I.Q.'s to range from 110 up; actually one-third of them have an I.Q. less than 110. Hence, either the Binet tests are not reliable indications of general intelligence or the teachers are not reliable detectors of real school ability or school ability is not closely associated with general intelligence. Presumably, the discrepancy is due in some measure to failure at each of these points, but we have evidence to show that the greatest unreliability lay in the selection made by the teachers.

To continue our answer to the question: In February, 1917, despite having started several weeks late in October, 1916, the Special Group had completed the work ordinarily covered in one school year. In June following, both grades had covered another year's work, except three or four months' work in history (which they were prevented from undertaking by circumstances beyond their control). In June, also, the Special Group was given final examinations in sixth-grade and seventh-grade subjects; nine of the Special Fifth and eight of the Special Sixth passed these examinations readily; three were absent. In the Special Fifth four, and in the Special Sixth four failed to pass in arithmetic. Of these eight failures (and you must remember that these mean failures to accomplish two years' work in one), it is certain that three were unjustifiable, and it is probable that one other was unjustifiable. I say this with confidence, because we had in our possession elaborate records of the performance of these pupils in a variety of standardized arithmetical tests—data surely sufficient to compare favorably with the results of a single unstandardized final examination. But these are not all the facts; this final examination was marked by the superintendent of schools by the method of allowing only zero credit for problems in which the method was correct but the computation wrong—this despite the fact that that method of grading papers had never been used before in this school and was not used (I think) in grading the papers of the Control Group. (The defense seems to be that gifted pupils ought not only to learn what other pupils do, and twice as fast, but also to do it better under test.) The remaining failures, including four in language, were those of pupils whose work was poor, who never should have been placed in the Special Group, who would have been rejected by our mental test criteria, and whose failure was predicted beforehand. We may conveniently summarize the matter in tabular form thus:

	Passed	Failed rightly	Failed wrongly	Absent
Gifted by test criteria.......	16	2	3	2
Not gifted by test criteria..	1	7	0	1

That is, of twenty-three pupils who would have been admitted to the Special Group by a system of mental tests, sixteen passed, two were absent, two were failed doubtless with right, three were wrongly failed; on the other hand, of the nine pupils who would not have been admitted to the Special Group by a system of mental tests, one passed, one was absent, and seven were rightly failed.

I believe this outcome shows conclusively that if the pupils are selected, not on a basis of school marks and classroom impressions, but by careful determination of their intelligence with the aid of mental tests, such selected gifted children can accomplish the work of the fifth and sixth or the sixth and seventh grades in one year.

But this is not the end of our answer to our question. The obverse side of the argument is yet to be noted. Our mental tests applied to the Control Group revealed certain pupils that quite consistently stood high, usually higher than our average pupil in the so-called "gifted class". More specifically, we determined by our mental tests six pupils in the Control Fifth and eight in the Control Sixth that would have been selected for the gifted classes had the tests been applied at the outset. Toward the end of the year we then asked the teachers of these Control Classes to name their best pupils, those that might conceivably (now that the teachers were looking at the matter in the light of the work going on in the Special Room) have been selected for that room in the first place. The teachers then named, of their own accord, five of the six selected by the mental tests as proper material for the Special Fifth and seven of the eight selected by mental tests as proper material for the Special Sixth. Of these children, let me add, four are known to have an I.Q. of over 120 and eight more probably an I.Q. of over 115. Four of these pupils lost a chance to enter the Special Group simply because they had not resided long in Urbana; they could not be well enough known by the teachers; they could be, and were, made known (tho too late) by the mental tests. We also discovered by our tests in the Control Group one very extraordinary child with an I.Q. of 167 (chronological age nine years, ten months; mental age sixteen years, five months). This girl had been previously taught at home, and on that account could not be rated by the teachers who made up the Special Group. She was transferred to the room in March, 1917, and passed her final examination for two years' work successfully in June of that same year. Miss Coy will publish in an early number of the *Journal of Applied Psychology* an account of this remarkable girl, whose ability, I should estimate roughly, is certainly better than that of 9,999 children in 10,000. It was, I feel, a rather neat demonstration of the serviceability of mental tests that we should have located this girl and saved her a year's time in the schools.

If we add together, then, our last two lines of argument, we see that the teachers selected several pupils who were clearly not gifted (in the sense of being able to do two years' work in one), and that they failed to select several other pupils who were surely gifted. Both errors would have been almost completely obviated by measuring the general intelligence of our entire group at the outset. It strikes me that if the waste of time and energy in both directions—the attempt to force along in the Special Group the eight pupils wrongly included and the failure to facilitate the school progress of the ten wrongly excluded—could be capitalized in dollars and cents, it would convince almost any doubting Thomas that it would pay the schools and pay the community to apply mental tests to the selection of gifted pupils for special-class work.

Still another argument, if one is needed. We asked the teachers of the Control Group to select for us a sample group of dull and another sample group of average pupils, and these two groups we tested with special care. Without going into details as to the tests employed or the technique of interpreting the results, we may state that in the group designated as "dull" there were no superior pupils and practically none of even average intelligence. On the contrary, in the group (there were six of them) designated as "average," we found three pupils who were quite certainly of superior intelligence (they had I.Q.'s of 119, 125, and 130). What is the conclusion from this? Is it not that, if psychological clinics, or at least "Binet testers," are needed for selecting dull and stupid children for special classes for the subnormal (as nearly all persons seem to agree), than *a fortiori,* they are an essential prerequisite for selecting superior children for special classes for the gifted?

To the general question previously propounded—To what extent did the teachers' selection justify itself in the subsequent work of the pupils and would a selection by means of mental tests have proved a better one? —the answer, I trust, has been made unequivocally. Mental tests are far more satisfactory devices for the selection of a class of gifted pupils than the judgment of the teachers as expressed by their school marks and by their general impressions.

One further matter needs clearing up, however, before I conclude. It might be objected that the application of the mental tests, however desirable theoretically, was impractical under ordinary conditions. It may be objected that the conclusions I have just reported took, after all, the best part of an expert's time for a year, and that no school system could afford to hire help of this sort and on this scale.

This objection is more apparent than real. Our extensive investigation was engineered not only to determine whether mental tests would be serviceable, but also expressly to find a short method of applying these tests. What I mean is that we are not proposing that anyone should repeat our work of applying some fifty tests to a group of school children, for we estimate that at least fifteen hundred hours of time were expended in our study. We have been able to sort our tests (I am speaking now of the psychological tests) into three groups. Restricting consideration to tests that can be applied by the group method (and only such tests can be considered for the quick investigation of numbers of school children), we have selected twenty-seven. Of these nine have been found to possess high value, nine medium value, and nine practically no value in separating the Special from the Control Group. Of the best nine we have again selected six that can be administered in one hundred and eleven minutes, including time for instructions, distributing materials, and the like. In two or three sessions, therefore, we can apply this combination of diagnostic group tests to any fourth, fifth, or sixth-grade class and in a short time select from the group the pupils who should be seriously considered in the formation of a class of gifted children. We would recommend that these pupils be then further examined by the Stanford Revision of the Binet tests—not so much to supply more accurate data as to their mental ability as to give the examiner an opportunity to form some acquaintance with each pupil and also to secure an index of general intelligence that may be directly compared with well-known standards of mental efficiency. It might also be desirable to use with them the analogies test and the Winch composition test, both of which are specially useful for diagnosis, and as effectively handled in individual as in group tests.

Further details as to the handling of this 111-minute combination of group mental tests are more appropriately discussed in our conference this afternoon. I can only hope, in closing, that I have convinced you both of the feasibility and of the desirability of segregating gifted children into special classes in the grade schools and of the very essential aid that scientific measurement can render in this process. If you are not yet convinced of these possibilities and desirabilities, I can at least hope that I have convinced you that there is a problem here that is open to argument and worthy of debate. Perhaps, after all, this is as much as a speaker can hope to accomplish in one short hour who is advocating a plan of operation in our public schools that has not as yet become commonly accepted practice.

Round Table: The Problem of Selecting and Training Exceptional Children in the Public Schools

GUY M. WHIPPLE

IN my talk this morning I presented the substance of my views upon the selection and training of gifted children. I put forward a series of questions and attempted to give the answers to a few of them, for instance, the relative importance of heredity and environment in the production of individuals of special achievement; the relative importance of establishing classes for the subnormal and the supernormal; how to distinguish between real excellence and pseudo-excellence; the best method of selecting pupils for a gifted class; at what school grade or grades this selection is feasible; what changes ought to take place in the curriculum, in the methods of instruction; what changes might or ought to take place rather, in the preparation and qualifications of teachers of these classes; what percentage of children in these schools could profitably be taught in these special classes, and so on.

You will recall that I went into detail more particularly with respect to the method of selecting the pupils and that I tried to demonstrate by quoting from the result of the experimental class at Urbana that it is very desirable to make this selection with the aid of mental tests, since these turn out to operate effectively, whereas the selection made by teachers is subject to numerous mistakes.

I take it that the conference this afternoon is not to hear anything further from me but to make you men from the firing-line present your comments and criticisms and pool your experiences in the educational handling of children of superior ability.

In order to set before you something for discussion that shall be pertinent to the general theme of mental measurement, I have prepared these two mimeographed sheets [not published in this bulletin]. The first one you will notice is merely a list of the tests that were employed in the study of gifted pupils at Urbana. This list contains both the mental tests and the educational tests and has been divided on the sheet before you in the two groups: the individual tests and the group tests. As you will see by the footnote, those of these tests to which an asterisk has been prefixed we have tried not only upon the Special Group of children but also upon the children in the Control Group. On the second mimeographed sheet you will see a summary of what I mentioned briefly in my talk this morning: an attempt to pick out twenty-seven of the mental tests which limit themselves readily to group testing, and by direct reference to the actual result obtained to determine which of them were of no value for separating the gifted from the ordinary children, which of them had a medium degree of value, and which had a superior value. Further on this sheet you will see an attempt to pick out six from the A group—those that had high value for separating the Special Group—and to arrange them in order for presentation in a total time of one hundred and eleven minutes, with the suggestion that these tests should be followed, if time is available, by two or three other tests, and that after provisional selection has been made by this group method, there might be individual testing by the Stanford Binet tests, perhaps with the use also of the analogies test. I present these materials not to attempt to force the discussion in this conference in the special direction of mental tests, but to supply you with information about the work which I reported, in a more detailed and convenient form than I could attempt to give it in my own talk this morning.

With these words of introduction I would like to declare this conference open. Are there any schools in the state that segregated different classes?

DEAN SMITH: There are, but I don't know whether they are experimenting with those groups. We might hear from certain ones. I happen to know there are such classes because the study shows there are. There are such groups here in the Bloomington schools in the buildings where the tests were carried on this afternoon.

MR. GILES: For many years in the Richmond Junior high school there has been a segregation at the end of the middle of the seventh grade, but we have had considerable difficulty in arranging that. It is done largely on the basis of the previous grades of the pupils. I don't know, I suppose that's common. It isn't altogether satisfactory. This segregated group is permitted to finish two years in a year and a half in the Garfield school in Richmond. They are also permitted to take foreign languages. The rest are not. I think that's about all.

DEAN SMITH: I know that in the Bloomington high school they have at different times segregated the pupils on the basis of sex and basis of ability in various subjects. One pupil in physics was able to do a whole year of physics in a half-year. I wish either Miss Kerr or Mr. Ramsey were here to explain that in detail. There are teachers here from the Bloomington schools who have tried the same plan with pupils. This plan of grouping on the basis of ability is carried all the way thru the city schools here. Miss Denny, of the primary grades, is here. Maybe she could explain about the plan in the grades.

MISS DENNY: When we see a difference in ability we begin to separate the children in the classes according to ability. This is at the end of the first month. So we go thru the year separating those children that show more ability. We trace them from one section to another and just let them do the best they can.

PROFESSOR WHIPPLE: How many sections in how large a class?

MISS DENNY: During the first half of the year we had four sections but toward the end of the first semester we have smaller groups and can give more attention to each individual.

PROFESSOR WHIPPLE: Did those children in the best group gain time in the system?

MISS DENNY: Always—sometimes a whole year. I have had a section go from the first year to the third. They are given just as advanced work as they are able to do.

PROFESSOR WHIPPLE: Do you mean they skipped the work of the second grade?

MISS DENNY: They don't skip it. They do the two years' work in one year by not being held back by slow children.

DEAN SMITH: I might say that in the one year a record was kept here that showed that approximately 55 per cent of all the children in the schools did twice the amount of work that they were normally expected to do.

MISS COLLINS: I would like to ask whether the children kept the record.

DEAN SMITH: I might say this, that very careful studies in regard to that point have been made in the city schools here and they show that the retention of the grades they make is high all the way thru and particularly of those who make up the work by taking it rapidly. That high degree of correlation does not exist to such an extent with those who make up the work by skipping a grade.

THE CHAIRMAN: I want to state that the plan followed generally thruout all of the grades in the schools beginning with the beginning grades—Miss Denny has explained it—is that the children are put into groups as soon as they manifest ability. That begins in the first grade. Then the teacher takes the different grades, say into the third grade. If the teacher in the third grade finds certain children who can do more rapid work, they are given the work and they may in the semester do one and a half semester's work. Now the next teacher takes the group—takes them where she finds them—and carries them along the same way. When they come to the Junior high school in the sixth grade the classes are divided so that instead of making it in three years some of the children make it in two and a half and occasionally in less time than that. If they do not make the full amount of time they are given additional work. The selection in the lower grades is made partly on the ability of the pupil. In the upper grades it is based on how well they have done previously and how well they are now doing.

PROFESSOR WHIPPLE: How much time do they gain in exceptional cases?

THE CHAIRMAN: We have one particular grade, a 6B grade that was permitted to do a semester's work in eight weeks of summer school. The report is that these pupils are doing work now much more rapidly than the other pupils—than other groups they have had.

DEAN SMITH: I would like to ask this question of those who have tried the plan, whether they have found out that there is a limit to the amount that can be made up during the eight years, and after that limit is reached whether they find the pupils do not maintain the high record afterwards. We have some evidence that if they make up more than two years they are too immature generally to keep pace with the other classmates of older age altho intellectually they can do certain phases of the work satisfactorily.

MR. BLACK: A certain school in Kokomo has for four years, I think, in the departmental work had a system of individual promotion by subject. They first stated a few principles they would agree to hold to. One of those I remember was that each child should be at his best all the time in all his subjects. They made promotions whenever a child was ready to move forward in any one subject, provided he did not neglect his other subjects. The data showed very satisfactory results. If Mr. Haworth is here, he perhaps has the data and can give the information better than I can.

MR. HAWORTH: I haven't the data with me. We did not separate the children into groups as to ability but we did allow the children to be promoted as rapidly as we thought they could go and we found that it worked very satisfactorily. The children were able to keep up the pace even after they went into the high school and we learned that a child could do the eight years of work in less than the usual time. There were some able to do it in six years who were also able to complete high school work within three years. So I think the best is to promote by subjects rather than massing them in groups. Even tho they mass them in groups there is always someone who can be faster in each group. So individual promotion by subject, I think, is the easiest thing we could have if we had a teaching force to carry it out.

MR. RAY: Whether they are too immature to do work later we tried to experiment in Indianapolis for a number of years—four or five years ago—of selecting a group of people in different centers at the middle of the seventh year and giving the three terms' work in one year. This was continued for three or four years. We followed them up in the high schools and we found the results unsatisfactory enough to abandon the practice, chiefly because the children found the work difficult when they went to high school in the third year. They went along very well the first year and some the second year, some of course went along well right thru the high-school course, but a large percentage of them found it quite difficult about the third year.

I might add the practice of the Indianapolis schools for a good many years—certainly fifteen years—has been this: In the primary grades the children are segregated into three classes on the basis of strength—class 1, 2, and 3—and frequently these groups in class 1 make three grades in a year. This segregation continues to intermediate grades and grammar grades. That's one thing that's done. The second thing is this: when we find a pupil that doesn't have enough work to do to keep him busy—who, we feel, is not developing enough—we put him in the next grade. Whenever a pupil stands out and we see that he evidently belongs in another grade, we just put him up. And in nine cases out of ten he makes good.

One other thing that is done in eight different centers of the city is the segregation into groups beginning the eighth year. They are put into a class and are given work in foreign language and in algebra in addition to other work and if they make good in it, they get a high-school credit. There is also a provision for giving high-school credits for superior work in English and civics. • Three lines of work are doing that.

PROFESSOR WHIPPLE: Your experience was somewhat different then from that at Baltimore with regard to the subsequent careers and high-school credits. Those pupils selected for separate work in the seventh grade, as I recall from the reports of Superintendent Van Sickle of Baltimore, who entered the high school thru the special classes did better work than others that entered thru the regular classes. Do you have any solution for this slumping of these pupils in the upper grades of the high school?

MR. RAY: I think it is perhaps this. We had them do too much work during this last year in the elementary schools. In addition to doing the regular elementary school work, they also had a foreign language and algebra, and so frequently when they went to high school they were worn out. However, I have come to the conclusion that the chief cause was the immaturity of these cases that fell by the wayside.

PROFESSOR WHIPPLE: I have a little evidence that the seventh and eighth grades are probably the least desirable places to try to force the progress of children and that may be precisely why the preparatory centers, while on the whole successful, do not come up to the glowing statement I made in my talk this morning. It would require probably some analysis of the school conditions with respect to curriculum, subject-matter, and instruction to determine why this thing is so. My observation is that special classes for gifted children move very smoothly in the fourth, fifth, and sixth grades, and we have just seen that they may operate successfully in first, second, and third grades, too. I collected thru the labors of graduate students, about three years ago, information with regard to the skipping of grades, my idea being to find out how advantageous grade-skipping was. Now the evidence seems very clear that a child with a little assistance could skip a grade anywhere before the seventh and eighth grades, and of course in many occasions he could skip the seventh and eighth grade, but taking it as a whole those were more difficult grades to jump in the school system than the six grades preceding.

I am interested to get further information and reports on that point and also to get further opinions on this matter of the possible difficulties of gifted children put in high school at an early age chronologically; whether they do suffer from the chronological immaturity. If the child is two or three years in advance mentally, then from the point of view of the psychologists, looking only at his intellectual age, he is just where he should be.

MR. BOOK: One of the important reasons for this slump is the matter of selection. If we had a better method of selecting these people—if we were sure that these people were truly gifted, we would have a different situation, I think.

It has been a long while since I read the result of Dr. Kuhlmann's work at Faribault, Minn., but as I recall it he tested a number of children, in fact all the school children, and made arrangements to put them ahead from one to two years. Then he tested them eight years, as I recall, successively, and if I remember there were no cases at all where the pupils had to go back when tested by careful division. They not only held their own but they were among the best in the grades. But I think they didn't let them skip the eighth grade. I don't remember the details —whether they let them skip grades or gave them a chance to make the work up.

PROFESSOR WHIPPLE: I recall a fact about a number of the children who failed to do two years' work in one. The superintendent of schools during the summer let all of the children go into the grade beyond and now some of the teachers are complaining because certain of the children who came from the superior mentality room don't get along well because of their immaturity. I got hold of the names of the children and found that they were the same that didn't pass the mental tests well.

MR. STOTT: I wonder if when you say two years in one you mean the pupil must do all the work that is scheduled for the two years in one. Do you mean to give all of the seventh- and eighth-year history in the seventh grade?

PROFESSOR WHIPPLE: So far as my own experiment is concerned, when I said these children accomplished the work of the sixth and fifth grades in one year, I did not mean that they performed every example in arithmetic performed by all other children. The reason they didn't was because they knew the method and didn't have to perform every example. I mean to say they went thru every operation, and passed the same examinations. We found that when these children were confronted with new work, it was not necessary to spend so much time on it practicing it. For example, it was decided that one of my graduate students should practice for one week in teaching this class a certain new step in arithmetic. I think it was the figuring of compound interest, let us say. Now he prepared a week's work in compound interest, introducing the subject, explaining it, referring to previous work, leading up to it just as it was done in the regular classes. He came to me at the end of the forty minutes and said, "I made an awful mistake, they know all about compound interest, and did everything in twelve minutes." As far as he could see everyone understood the principle and it was just a matter of a little drill to carry the idea thru. (I don't know whether that was the actual topic or not.) That's what I mean by saying two years' work in one.

MR. HIMELICK: We are going on a little different plan in our schools. I sometimes feel that the strong can always help the weak. Therefore we are working on that basis. So far we have found that by putting the very strong pupils and some of the weak pupils together and using those strong pupils as helpers, we might say, for the weaker ones, that both advance much more rapidly. Now, of course, that doesn't say that the stronger pupils might not advance more rapidly yet, if they were not held down by those weak pupils.

We have only been working this now for little more than a half-year. One of the teachers told me the other day that in some cases she believed it possible to start in November and have a number of children do the full two years' work after November and still have some time left for doing something beyond that. I think we have gone far enough with these experiments to realize that we have undoubtedly wasted a great deal of time in certain types of preparation in the course of study in order to fill in the additional time which has been added in the way of an extended long term. There was an article on this point in one of our city papers, which I think shows that the public in general is thinking about it and the philosophy of this article was pretty good. This article said that in the state of Indiana there are schools that have 140 days and some that have 150 days, while in Fort Wayne they have 200 days. Now taking these children that have 140 days, they complete the work in eight years while it takes 200 days in Fort Wayne. The editor of the newspaper went on to say, "Does that mean that we have so much better teaching out in the country schools?" Now we thought that was pretty fair reasoning and was worth while thinking about, so we started to work.

I want to say just this word while I have the floor and that is that this work is going to move along very slowly in practice unless the universities and normal schools and other institutions which have to do with the training of teachers give these people, not so much of this question that they do not understand, but give some of the fundamentals, then give enough actual practice working in the schools, and do this work in a way which will meet the approval of the community, because that is the thing a superintendent must take into consideration. This is work that must be taken care of well and I believe the danger is in putting teachers in the work before they know how to do it.

We have tried in Fort Wayne to run the two things together. I have been meeting as often as possible, sometimes four or five times a week, with these teachers and the principals who were having this work in charge and we discussed some certain phases, not a lot of them. Then they would go back and work it out in a practical way. Instead of seven years being abundant to finish this course of eight years, I would say that six years was abundant. I really think five is abundant.

MR. BLACK: The teachers of the Central school of Kokomo reported to me quite a number of things they have found. First, they found that there was quite a lot in the course of study that did not need to be taught at all; that the child would find out for himself. A second thing was that some of that work can be done as well or better outside of school, using the class period largely for helping the child to do something he can't do by himself or that he can't do nearly so well. A third thing was that when responsibility was shown to the child with regard to his proposition, he worked with a greater intensity and was able to accomplish a good deal more. Another thing was that the teacher gave more attention to the individual in his advancement and so saved a large amount of time for that child, by going forward with any given subject when he was ready. Then the teacher taught more intensely. She found that she could in many instances teach a given topic in ten or fifteen minutes that she had been giving thirty minutes to, and get a better result. She could teach the topic in ten or twelve minutes and rest the remainder of the time. That was wasted time for her and the children, so it showed that she could do other things in that time. So they found by these things they could save the child an immense amount of time.

PROFESSOR WHIPPLE: I spoke this morning about Louisville and I would like to ask Miss Race to say something about that class.

MISS RACE: Two years ago in the fall of 1916, was organized, by the supervisors of the city, a class for two years' work in one. The class consisted of pupils that were over age, some that were under age, and some with remarkable ability, so we began to study these children to find out by these tests whether the children couldn't do better. After giving these tests we had twenty-five children in the class who ranked in intelligence quotient from 120 to 168. The teacher these children had was excellent and we feel that the success was partly due to her. However, these children did two years' work in one with very great ease. They were very happy as well as doing two years' work in one. We did have some good teachers but at the same time the happiness and ability of the children was quite remarkable.

Now, we don't crowd the children and we do try to make the curriculum just as rich and extensive as we can possibly do it. This year we are conducting tests to show their ability to reason in historical subject-matter and we are comparing this work with the work of children in the 5A class that average two years older. We have spent so far ten days on the special questions that have been worked out, these questions having to do with the subject-matter in history which they cover. We covered in the ten days the study of the settlement of Massachusetts and New York. We find that these children do better work in history than the 7B grade, that they think better, that they are resourceful in their thinking. What they will do in the next ten days, we don't know.

Every child knows all the time what he has done. We find out that these gifted children seem to be so much more interested in contest work than in association work. We had an addition test, and at first some gifted children were bored, didn't want to do it, but we found out that when they were being compared with others, the work which they did was very remarkable, which seemed to me to show that bad training could hurt them. Some of the work they did in addition when we first began showed they were doing it very poorly. After they were trained to do addition properly, the advance they made was quite remarkable, so it seems to me we had a right to know that gifted children could be spoiled and injured in the training as well as children that were not gifted, and that they are susceptible to good training to a greater degree than children who are not.

I might say that in Louisville the superintendent and everybody that is connected with the system is very much delighted with it and asked that we conduct other such classes.

MR. PRICE: Practically all the work of segregated classes for gifted children is in the elementary schools. We have been working on the assumption that all the pupils in the high school are getting educational measurements. The Bloomington high school has recently adopted some segregation. The head of the English department is here and I would like to have a word from him.

MR. HUDELSON: Last year we attempted a segregation in the sophomore year of the high school, based upon the teacher's record of the pupil, the present record, and his past record. If his present record was far below his previous record, then we didn't discard him on that alone, but we took his average. We divided the class into three sections. We chose the sophomore year because here there were enough pupils for three sections. Some indication might be made of the effect produced after one week. Miss Corey had the good section. Presently the one who had the other section said, "That's a joke on you, you gave me the good section," and a few days later the one who had the poor section said, "That's one on you, I have the good section." But I do claim for the good section—I have observed more than others—there is a decided increase—there is opportunity for a decided increase, with a richer, a purer atmosphere about the literature and far greater incentive in composition. One girl in the class sets the pace in composition, in vocabulary, in construction, and the others are trying to live up to it. It is not high-brow; it is a pure atmosphere and a more congenial feeling.

Some Future Possibilities of Mental Testing

GUY M. WHIPPLE

PREDICTION of the future development of any branch of scientific activity is always a fascinating and sometimes an instructive pastime. In a way the prophet is safe enough, because by the time his prophecies have been tested, most of his hearers will have forgotten him and his forecasts. Yet, to avoid the chance of being entirely discredited, most prophets like to base their readings of the future on the past, as the palmist who claims to foretell careers by the lines already graven in the hand, but he who would foretell the future possibilities of mental testing has unfortunately but a short history upon which to base his prediction of what is to come.

Think that there was not even a psychological laboratory before 1878, that for years thereafter no psychologist displayed more than a transient and casual concern for the practical application of his researches; that Binet, whose name is now almost as well known, one might believe, as that of many second-string prize-fighters, began writing about the diagnositc possibilities of combinations of mental tests only in 1905, and really attracted attention to an appreciable amount only from 1908 on, and that the development of a professional consciousness among those now actively concerned in diagnosis by mental tests is so recent a matter that only within a few months have workers in clinical psychology deemed it expedient to organize formally.

We have, then, only a few short years, say a decade, to scrutinize in our attempt to outline future possibilities. Worse yet, tho these years are few, they have been uncommonly full of activity. Would Binet, for instance, ever have believed that before the advent of this present year there would have been published seven hundred and eleven magazine articles, monographs, or treatises dealing with his tests? Or would any of the older members of the American Psychological Association have believed that a type of work that had never been dreamed of a few years ago would have come to occupy so strikingly prominent a place on its annual programs?

It is just this intensity of activity in mental testing that makes prediction of its future uncertain; it may mean that we have virtually uncovered and explored all the really significant ramifications of mental testing; or, on the contrary, it may mean that a very much more striking series of discoveries awaits the investigators of the future. I confess that sometimes I lean to the one, sometimes to the other, of these interpretations, and similar differences of opinion are indicated in the symposium upon the outlook for mental testing recently conducted by Professor Seashore in the columns of the *Journal of Educational Psychology*.

Thus, for instance, there are several men whose names are well known in this field who are absolutely confident that in the future we shall by means of mental tests arrive at a quantitative formulation of the non-intellectual elements of mentality; that we shall be able to measure the conative aspects of mind, to have a scale of emotionality, to make diagrams of personality and character. There are other men, equally competent, who appear to be equally certain that mental tests can never pry into these more intricate and subtle phases of human nature, who feel that the technique of mental testing is essentially one that limits the method to the investigation or the cognitive phases, and that there is enough to do in that direction without going on a wild-goose chase and wasting valuable time in striving for the unattainable. There are others, I think, who feel that some progress will be made, slowly, in applying our quantitative methods to the investigation of character, but that in the main we shall have to rely upon inferences from intellectual conditions to certain correlative non-intellectual conditions. We know, for instance, that a high degree of general intelligence tends distinctly to carry with it a good degree of these quasi-moral qualities, like industry, freedom from prejudice, and well-developed ideals, that enable this kind of intelligence to realize its latent possibilities. I think myself that progress is certain to be made, on the one hand in the critical and patient analysis of these non-intellectual aspects of mental life, and on the other hand in the collection of a series of methods of attack (not necessarily always by means of mental tests as we now know them) for describing and recording these traits of personality. Everyone that uses mental tests knows that they often incidentally furnish illuminating sidelights upon the personality of the person under examination, whose method of approaching the test, of attacking the problem set before him, is frequently quite characteristic. Thus, Dr. Weidensall, when applying to women at the Bedford Reformatory the mirror-drawing test (introduced into her series for a totally different purpose, which it more or less failed, by the way, to accomplish), found that the test was useful in indicating certain emotive and volitional dispositions. She says:

> "Chiefly, however, is the test of interest in the case of those who are clever enough to trace the star well. . . . These are invariably the girls who are difficult to manage in the institution. The tracing goes well enough until suddenly, at a hard point, the pencil starts, and persists upon going, in the wrong direction. The subject then tugs and pulls, grows more and more irritated, disturbed and excited, makes big black circles and unprofitable markings, soon loses all control of herself and finally throws down the pencil and gives up. When calmed, praised and urged, she will continue and, in the end, usually draws a fairly good fifth star. No other test has so uniformly and conspicuously precipitated this state of instability on the part of the more excitable inmates, who work well as long as they meet with easy success, but who have not reserve force or stability in the face of a difficult situation which demands of them patience and perserverance. Their behavior in tracing these stars is surprisingly typical of their behavior in the institution where, when discipline, or the duties for which they are responsible, become the least pressing or demanding, they lose all control of themselves. Some such test as this is very essential in a clearing-house which is to advise with reference to the wisest disposal and treatment of court cases."*

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* *The Mentality of the Criminal Woman*, p. 225.

Of course, this is only an isolated instance and perhaps an extreme one, but it shows how mental testing may well bring out here and there these important indications of non-intellectual traits. When we get enough such instances, it may not be impossible to produce a scale of volitional abilities. As Dr. Bingham remarks: "Webb, in his recent study of *Character and Intelligence* has certainly made out a strong case for the existence of a second general factor in addition to the intellective factor of general ability, a factor that would be popularly designated as 'character' and which Webb suggests may take the form of persistence of motive. The man of science who makes a workable scale for measuring persistence of motive will take rank with Binet. The task seems fantastic, but no more fantastic than did the proposal in 1905 to have a graded scale of intelligence."

But I introduced this instance about the future possibilities of mental testing in the realm of personality and character primarily to illustrate my statement that active workers in the field expressed opposite notions as to these possibilities. May I now return to the general problem and seek to set forth more systematically the possibilities of mental testing in various directions?

In the present-day work of mental testers one may readily distinguish two fairly distinct lines of effort—the one is the effort to determine, perhaps somewhat roughly and usually somewhat quickly, the approximate level, or quantum, of general intelligence; the other is the effort to determine, perhaps more precisely, the existence or the amounts of special aptitudes or abilities. Perhaps it would be profitable to distinguish a third line of effort—in a way a combination of these two—the effort by the careful application of a considerable number of isolated tests to secure a reasonably complete picture of the mentality of an individual. I speak of this attempt at psychographing individual mentalities as a sort of combination of the two other lines of effort, because it proceeds on the assumption that each individual is a bundle of specific abilities and that a complete description of these abilities would afford a reasonably complete description of the individual; or, again, we might say that this sort of testing compares with the first sort, the determination of the quantum of general intelligence, as an analytic account compares with unanalyzed, proximate description. Two individuals, say two school children, might possess the same amount of general intelligence as indicated on the Binet scale, yet analysis of their mental make-up by a series of tests of specific abilities might show a quite different qualitative make-up: one child might excel in memory for digits, the other in reasoning about abstract situations; one might possess high ability to handle numerical relations accurately; the other might be richly endowed with literary appreciation, and so on.

What about the future in these several directions? I feel sure that in the immediate future the determination of general intelligence will occupy the forefront of interest in the development of mental tests. This is the field that is being most exploited now, and we must admit that it returns the greatest yield for the time and labor expended.

The Binet tests are responsible for this aspect of mental testing. They have been accepted by the general public as a useful tool. Most school systems, courts, penal, charitable, and corrective institutions use them. It is not to be supposed that this widespread use will cease or even appreciably decline in the immediate future, despite the fact that some quacks and charlatans have invaded our territory and that well-meaning but ignorant friends have made mistakes and brought discredit upon the movement. There will be modifications of detail and further revisions and improvements. There will come in time a better realization of the limitations of Binet testing, and indeed, of testing in general. For one I feel that experts in the field have been ready to acknowledge these limitations and that most of the damage done by extravagant claims as to what can be done in the testing of general intelligence has come from the hands of amateurs, usually quite devoid of any intent to mislead.

Within the profession, the Binet tests have been, as many of you know, more or less of a storm center; there has been much controversy over details of method, over scoring, over the interpretation of results, the best formulation of the tests to use, the qualifications of testers, the relative merits of "age-level" *vs.* "point" systems, the degree of reliability to be placed in the intelligence quotient, the range of ages to which the method can be applied, etc. I must confess that I find myself of two minds with regard to these discussions, which have been responsible for a truly voluminous amount of writing and almost wearisome amount of reading of papers at scientific meetings. When I adopt the attitude of the man of science, concerned in the development of accurate methods of mental measurements, I feel that this discussion is most vital; when I see the use of the tests in practice and consider the real aim of most of the users, all these discussions of my colleagues strike me as another tempest in a tea-pot (except, of course, those discussions in which I have participated myself!). What I mean to bring out is that the amount of precision you should exact in the work of a mental tester depends in the last resort upon what you propose to do with the results of the testing. If, for illustration, a rough provisional classification of pupils in public school classes is the only object, and if, presumably, the classification is open to alteration later, I see no reason why a teacher who had never read Ward's article on "Psychology" in the *British Encyclopedia* and who wouldn't understand two paragraphs of it if she did read (and, I was going to add, wouldn't know anything more about the minds of her pupils if she could understand it)—I see no reason why such a teacher, given moderately good intelligence and six or eight weeks' training in mental testing, might not take a good manual of directions for conducting the Binet tests and carry out the classification I have mentioned without doing any serious damage to any pupil and almost certainly with the net result that the educational progress of the pupils in question, taken as a group, would be measurably enhanced. For the expert to protest against this sort of work is like a laboratory chemist protesting against the housewife measuring out her baking-powder, flour, and milk with teaspoon and cup instead of installing a chemical balance and graduated pipettes. What's the difference if the cake is palatable!

On the other hand, I can see readily enough, and I have seen repeatedly in the field of mental testing, illustrations of the old adage that "a little knowledge is a dangerous thing." If the computations of an amateur tester affect seriously the life of a child—as in passing formal judgment for the benefit of school or court authorities that the child is feeble-minded—then it is time that steps were taken to insist upon certain minimal qualifications for this work. For this reason I believe that the future will see recognition of this idea that, while some aspects of mental testing are so simple and comparatively—harmless, shall we say—that any ordinarily intelligent person may be speedily trained to undertake them, there are other aspects for which there will come to be established specific qualifications, possibly required by legal enactment or at least promulgated and indorsed by a group of experts in the field. I spoke of the establishment of the American Association of Clinical Psychologists. This body, I believe, will be able in the near future, not only to decide what kind of persons ought to carry on the more important diagnostic work with mental tests, but also to bring pressure to bear so that only persons of that sort shall be employed as state psychologists, clinical psychological assistants, institutional psychologists and the like. Ultimately, I believe, this phase of mentality testing—the use of diagnostic methods for rating individuals as to their general intelligence—will come to have a sort of official professional existence, with safeguarding regulations, comparable, somewhat remotely perhaps, with those now obtaining in the medical and in the legal professions.

This leads me to another matter of considerable moment for the future of mental testing. There has been, and still is, a considerable difference of opinion between psychologists and physicians as to the province of each in the use of diagnostic tests. Many psychologists are thoroly convinced that the medical profession, as now constituted and as ordinarily represented, is quite unqualified for the undertaking of psychological investigation or even for determining the grosser types of mental retardation or for successfully attempting to diagnose mental insufficiency or for prescribing methods of psychological or educational treatment. Many medical authorities, particularly those whose work lies in the realm of psychiatry, are equally thoroly convinced that the average psychologist and "mental tester" is quite unqualified to deal with the characteristic cases of mental deficiency, for lack of intimate knowledge of medical lore. One of the developments of the future in mental testing must be a mutual understanding between the psychologists and the physicians, a clearing up of the boundaries between the two callings, and a disposition to settle disputes by team work and by objective evidence as to what each type of training is good for. I have the feeling that there has been important progress in this direction within the past few months. Thus, in the introduction into the military service of psychological tests of all recruits, there was much anxiety on the part of the psychologists as to the reception of their proposals by the medical officers of the military service. In our preliminary work, pains were taken to have our work instituted under the authority of the medical officers in the cantonments and to report all results to these officers. This attitude has met with commendable courtesy by the medical men generally—witness the courtesy of a committee of psychiatrists in putting at the disposal of psychologists a considerable sum of money for the undertaking of preliminary investigations as to the usefulness of mental tests in the army. And now, quite recently, there has been established by order of the General Staff, a Division of Psychology, coördinate with the Division of Psychiatry, and I am told that Surgeon-General Gorgas has within a few weeks declared that the addition of the psychologists to the staff of scientific workers in his domain is the most important single advance that has been made there in recent years. Can we not hope that this rapid rapprochement between psychological and medical workers, stimulated by the exigencies of war, will be a permanent one, so that the future development of mental testing in the realm of clinical work will find the physician sympathetic and encouraging and the psychologist clearer as to his province and its relation to that of the physician?

Speaking of these military tests, the details of which cannot be entered into on this occasion, can we not see in them a striking demonstration of what may be accomplished in the future of mental testing in avenues of which we do not dream at present? When, almost exactly a year ago, members of the American Psychological Association first instituted various committees to look into the possibilities of making their science useful to their country, I venture to say that none of those who constituted the Committee on the Mental Examination of Recruits even dreamed of such successful developments as have been effected. Yet within eight or ten months it has been possible to devise a system of group tests, to obtain preliminary data with them, to revise the tests, to apply the revision to several thousand recruits, privates as well as officers, and then to make another revision, in the light of these results, and to proceed with its application in other cantonments, as well as to arrange for special forms of examination for illiteracy and for individual examination, and to establish a training class for the rapid schooling of some two hundred or more selected psychologists who are soon to undertake the formidable enterprise of securing a record of the mental status of every recruit in the National Army. The fact that eighty per cent of the company commanders whose men have been examined have reported directly to the Washington authorities their unqualified approval of the mental examination as a device in military life is enough to show that the success of the enterprise is attested not merely in the satisfaction of the academic men who brought it into being, but also in the satisfaction of the hard-headed officers whose only concern lay in the contribution of the tests to their task of getting an efficient body of soldiers into France as rapidly as possible.

The army testing has to my mind yet another significance for the future of mental tests. All of us who assembled at Vineland to work as a committee in formulating the army tests felt that the necessity that brought us together was a most fortunate one for our science. I have said a number of times, and I begin to think that there is little hyperbole in the statement, that mental testing was set forward as far in the six weeks our army testing committee worked at Vineland as it would have gone otherwise in six years. The reasons are clear enough: we had a strong motive for doing our utmost to perfect a system of tests; we had time enough to get acquainted with one another's foibles; we had opportunity to thrash out disputed points of technique. All the members felt that one of the best things that could happen would be that a similar group of workers in mental tests could be gathered together every year, like the designers of the Liberty motor, figuratively locked in a laboratory until the problem in hand was solved.

On the other hand, I must say that I have never believed that progress in mental testing would ever come from the appointment of committees, as committees usually go. We have had committees of the American Psychological Association on the Standardization of Mental Tests, and I believe their members themselves would admit that their labors had not been very productive of permanent advance. The ordinary committee does not work under the exceptional circumstances that attended the work of the Committee on the Examination of Recruits. It takes time, energy, money, a strong motive, and a chance for continous sessions to produce a permanent advance. For this reason I do not share the opinion of some of my colleagues who, in their contributions to Professor Seashore's symposium, declared that the way to further the development of mental testing in the future was by the appointment of committees of various sorts.

Another proposal of interest is the one made in the same connection by Dr. Wallin, who argued that for the next few years there ought to be undertaken a tremendous attempt at standardizing a number of tests. Everyone who has worked in this field beyond the bare limits of the Binet tests (and even within those, too) is well convinced of this need of standardization. In fact, I am ready to say that this ought to be the prime work of the next few years, particularly in the direction of producing standardized tests for adults. I think that every test that is proving to be of intrinsic value ought to be given an extended trial under carefully prescribed conditions of administration and the results worked out to show a complete account of the outcome of the test as affected by sex, age, social status, school grade, intellectual endowment, and all the other factors that contribute to influence that outcome. Work of this sort has already been done, for instance, by Pintner in his standardization of certain performance tests, by Wallin in his norms for form-boards. If this kind of work can be kept up, we shall have eventually for a large number of specific, definite, objective tasks, complete knowledge of the responses of persons of any assignable class or group of the population. It will then be possible, I believe, to combine these tests in various ways into groups of tests that will provide useful scales for measuring quite varied aspects of mental capacity, just as in educational measurement we can now take measurements of ability in arithmetic to add, subtract, multiply, divide, select operations, or reason out procedure. It will be necessary, incidentally, to secure meanwhile several equivalent tests for each one of these different mental tasks, to provide our test material in duplicate or triplicate sets, so that the mental ability of the same person can be probed repeatedly without danger of familiarizing him with the test material.

A task of this magnitude is enough to keep a large number of workers busy for a long time. It is a task that really needs a good deal of patience, because it is rather monotonous and the final results are not such as to attract attention, like brilliant and clever inventions of new tests. This, I take it, is what has led Dr. Wallin to declare, in commenting on the future needs and possibilities of mental testing: "This work should be undertaken by a station of psychological tests and standards, supported on an adequate scale either by a private research foundation or by a government subvention. The station should command a budget of about $50,000 annually. If this work is worth doing at all, it is worth doing well. In order to obtain reliable norms it would be desirable to test many thousands of cases from infancy to maturity. The needs of such a bureau have been presented before, but no effective action has yet come from the agitation."

While we are speaking of this future activity in standardizing various mental tests, I am led to say that there are several directions in which this need is peculiarly felt. Thus, for instance, we need in the early future to get together much information as to the effect of race and of social status upon the results of mental tests. We know very little of these matters, and much of the evidence thus far adduced has proved conflicting and confusing. When the Kentucky mountaineer, who sees the first railroad train of his life on his way to the army cantonment, takes our military mental tests alongside the youth just drafted from a college class, how much allowance must we make for this divergence of environment in our attempt to arrive at a correct notion of the real, the intrinsic mental capacity of the two men? Do pupils from the slum districts have a fair show in the Binet tests when their records are directly compared with those of pupils from homes of superlative refinement? Can we directly compare the records of Frenchmen, Englishmen, Italians, Lithuanians, Chinese, Patagonians, and Esquimaux? Or if not, what kind of corrective formulas are we to apply?

Again, we need in the future to extend much further our modifications of well-known tests for application to physical defectives, to the blind, to the deaf, in particular. And how may we successfully determine by mental measurement the intrinsic capacities of illiterates?

Again, what has just been said implies that we need, at the outset, to work out satisfactory extensions of methods of intelligence testing for use with adults generally. When we began work with the military tests it was almost a revelation to discover how little anyone of us really knew about the common, "garden variety" of adult. We knew much about school children, but little about the rank and file of men who would be assembled by the machinery of the draft. Many of our test instructions, in particular, had to be radically revised after our first attempts. On the whole, I think that the military testing will solve most of these problems, and if the time ever comes when competent men can be turned loose upon the marvelous mass of data that will be available when we shall have measured hundreds of thousands of the adult male population, there ought to be made available unlimited information as to the reaction to a characteristic group of mental tests of a great body of adults.

Right here there appears a special aspect of this problem that interests many of us exceedingly. I refer to the possibilities of future mental testing of young men and women who are entering our higher institutions of learning. We are rapidly approaching the time when we can apply the mental tests to college entrants in a manner that shall be not only economical of time, but also productive of much useful information. There are a number of workers in this field, of whom I am one, who look forward with anticipation to the day when an examination by mental tests of their general level of intelligence will be regarded as just as obviously a regulation part of the admission of freshmen to our colleges as are the physical or medical examination and the examinations of various sorts directed to knowledge of subject-matter that are at present generally in vogue. Most college professors would agree with me that it would be of the greatest service, both to the colleges and to the students in them, if a certain fraction of these students had never been permitted to enter. What that fraction is, you may debate. I would guess that the exclusion of the lowest twenty per cent of our present college entrants would be distinctly advantageous to all concerned. Just consider the big "mortality" of the freshman year; think of the number of students who are dropped at the end of the first semester; think of the others who are dropped from time to time as the other semesters roll around. Think of the never-ending line of delinquent students that worry the souls of deans and committees on student standing. The question at issue is simple enough. Is the student before you delinquent because of ill health, poor teaching, poor preparation, laziness, wrong attitude toward his work, or inherent lack of mental capacity? The last-named factor is just the one that mental tests could measure, but the one that, as things now go, has to be guessed at by the administrative authorities. I have been experimenting in a somewhat dilettante way with some of these cases. I have had them referred to me by the officials at the University of Illinois. I have been able in many cases to give advice, based on objective evidence, that has led to a quick decision of the issue. In illustration, I found last year a student who had been conditioned by the instructing staff in our College of Agriculture. The question was whether he ought to be dropped or urged to apply himself or advised to register in some other type of work. The application of a half-dozen mental tests demonstrated that in four of the six this student's performance ran off the lower edge of my high-school distribution charts; I mean that his performance was poorer than that of any one of four hundred high-school students, including freshmen, on which my graphs of distribution were based. It didn't take the officials long to decide that a young man whose innate capacity was less than any student in the Urbana high school was not wanted in the University of Illinois.

But, now, the moral of all this is: Why was this student ever permitted to enter the University? It is easy to see, is it not, why many of us engaged in mental testing want to establish, in the immediate future, some system whereby the admission of students shall be conditioned upon the attainment of a satisfactory standing in tests of general intelligence? So far as the actual devising of suitable tests is concerned, I think we have already come to the point where we can "deliver the goods". We psychologists can arrange not a perfect but a working program if the administrative features can be arranged by the officials who are interested in college entrance examinations. As Dr. Bingham remarks: "Five years ago such a program would have seemed fatuous; and at the present time much less can be accomplished than certain fervent believers in mentality testing have led some people to expect. But technique and available norms have been perfected to a point where the worth of mentality testing of college students is already proving itself." If I may be permitted to speak again of my own interest in this field, I would like to say that I am now hoping to devote a considerable share of my time in the next few years to the development of this work of student testing at the Carnegie Institute of Technology. We plan there to establish a Bureau of Educational Investigation and Research, one of the tasks of which will be to assist in the perfecting of a system of mental tests that shall be applied to all entering and again to all leaving students. Of the possibilities of such a bureau I am most optimistic.

But to do this in one institution would accomplish only a limited amount of improvement in the general situation. How work of this sort might in the future be extended on a wide scale is one of the roseate "pipe-dreams" in which the cold-blooded man of science sometimes permits himself to indulge. Why not, for instance, establish in various convenient centers (preferably in towns and cities where there are colleges and universities maintaining psychological laboratories) a series of testing bureaus? Let each bureau be administered by a competent applied psychologist (there will be a couple of hundred men expert in applying mental tests when the war is over) and provided with student research assistants and one or two high-class stenographic clerks, competent to score papers and do ordinary statistical work. Let all students who desire entrance to college report before hand at one of these bureaus, pay a fee that will cover or partially cover the cost of their examination, and take the prescribed mental tests. Each one will then receive from the Bureau an official certificate stating that he has been examined at such and such a bureau on such and such a date and is certified to possess Class A, or D, or whatever it might be, grade of general intelligence. Colleges could then specify that applicants for entrance must be of Class D or some other designated degree of ability just as they specify that they must be seventeen years of age or whatever relatively unimportant dead-line they now try to establish to protect themselves from the influx of incompetent students. While we are indulging in this dream why not continue and assume that business firms can make similar requirements for salesgirls, department heads, delivery drivers, and all other grades and brands of employees? I see nothing at all impossible in this notion.

All that I have said thus far has been directed more especially to the future of general intelligence testing. That field, as I remarked, is the most promising, the easiest to develop, and on the whole probably the most important, because, after all, degree of general intelligence is the one towering factor in accomplishment in any field of endeavor.

There are a number of other possibilities of the future that might be discussed here, did time permit, as for example, the possibility of assembling sufficient information about the rate of mental development so that, after two or three measures of the intelligence of a given child, one could predict the curve of mental development for the rest of that child's life. Or again, the desirability of experimenting extensively with different methods of scoring all important tests, in order to work out empirically the best method of scoring each test, not only in general, but as it is applied for a given purpose, to children of a given age, or under any assignable special conditions. Recent undertakings in this direction suggest to my mind that perhaps many tests may be found under this treatment to possess merits of which we have remained in ignorance. Yet again, the need of studying much more fully than we have the effect of repetition of the same test with the same individual, or, to put the matter differently, the effect of practice in mental tests and the significance for intelligence generally, of varying degrees of susceptibility to practice. But these possibilities of future development I can merely mention in passing.

The development of special tests for special aptitudes, to turn to my second main division, will also make progress in the future, only that progress, I believe, will be much slower. The pressure that will motivate most of the work here will come from those who are interested in vocational selection and guidance. Some things are already pretty clear. It is certainly going to be easier, for instance, to select the man for the job than to select the job for the man. That is, it is easier to say to an examinee, You cannot profitably undertake to be a musician or a telegraph operator, or a clergyman, than it is to say, You are fitted to be a clergyman or a telegraph operator or a musician.

In principle, either kind of vocational selection implies preliminary job analysis, and this is much less simple than it seems. To say what persons can become good stenographers implies that one knows, first of all, the special types of ability that combine to produce the best stenographers, and second that we can devise adequate tests for these abilities. The number of demands that are made on the psychologist for work of this sort is greater than most of your would suppose. In our Bureau of Salesmanship Research at Pittsburgh, for instance, we are often asked to construct a card-catalog system that shall indicate the precise qualifications needed for every one of the several hundred different positions in a large commercial or industrial organization, and asked, not infrequently, to have the catalog made in a week's time! When officials in such concerns are assured that an expert might in ten years' time work out specifications for eight or ten jobs and devise the necessary tests for them, the reaction is often amusing, to put it mildly.

I feel that this sort of work will take much time and patience. Yet we have already several suggestive beginnings, as, for example, Seashore's analysis of the qualifications of a singer.

There is also the possibility that our advance in this direction may take on sudden impetus by an attack of another sort. While, as I have just said, in principle, we have to analyze each calling before we can construct tests for the specific abilities that it demands, it is possible in practice to let the analysis go, or to make a rough guess at it, then apply promiscuously a lot of mental tests that might conceivably have some bearing on the occupation, and subsequently check up the results of applying these tests to hundreds of applicants for the job with their subsequent success in it. If our charge of buckshot is heavy enough and moderately well aimed, we may hit something. We may discover that a certain mental test or a certain combination of tests, perhaps to our surprise, happens to put a premium on those specific abilities that render persons successful in the job in question. If we do, we have secured our practical end, and we may at our leisure sit down and try to figure out how the tests that work so well are connected psychologically with the job they test. Thus, we find that applicants for positions as stenographers who make high records in completion tests are more likely to prove competent stenographers than those who make low records in such tests. Further illustrations of the work of ferreting out tests for vocational guidance have been given in demonstrations in this conference.

On the whole, then, I feel that the development of tests for specialized abilities is quite difficult and likely to move more slowly than the work with tests of general ability. We need to be cautious in our prophecies and to warn the portion of the public that is specially interested, against the seductions of charlatans or their own over-emphasis of the possibilities of help from the psychologist.

Finally, let me speak briefly of what I termed the third main direction of activity in mental testing—the development of methods for the elaborate and extensive mental examination of individuals. An excellent survey of this field of work was provided by Stern in his *Differentielle Psychologie*, in 1911. Tho important beginnings have been made, the field has been relatively a neglected one. It requires real psychological insight on the part of the examiner, a vast amount of patient investigation, and also a considerable technical skill. Work of this sort cannot be done by the dozens of Binet workers who get on very well in their measurement of general intelligence. In the past this sort of work has been much hampered by the lack of suitable norms for the tests that were actually available. Again, when one is engaged in this type of investigation, one cannot be content with short-cuts, generalities, and approximations.

A typical illustration may be found in any case in which the psychologist desires a quite complete account of the mentality of the examinee. Take, for instance, the testing of the mentality of a gifted child, a Winifred Stoner or a William James Sidis. To discover by simple testing that such a child has an I.Q. of a given amount is interesting, but it fails to get us anywhere in our real inquiry as to just which ones of the various mental functions are possessed of the extraordinary heightened efficiency. Is it memory span or capacity for concentrated attention or ability to handle symbols or apprehension of abstract relations or acute perceptive capacity or lively imagination or originality or breadth of associative tendencies or speed of learning or what that demarcates such a child from other children? What about his special abilities: does his musical, mechanical, arithmetical, linguistic, dramatic, executive, poetic, artistic and so forth, ability exhibit the same unusual development or not? These questions compel us to plan out an elaborate program of mental testing and to carry this forward on the one individual until we can plot for him a comprehensive "psychogram," a "psychological profile," as Rossolimo terms it. And even when this is done, it is difficult of precise interpretation unless we know the psychograms of others with which to compare it. For me personally this kind of mental testing exerts a great fascination. I would like nothing better than to work at it for years, but it is hard to find the time that is needed, or to find a university that feels like supplying my wife and children with bread and butter in return for my labors in such a field! One thing is certain, whoever undertakes work in this field is cured of all tendencies to think too simply of the adult human mind!

A special field in this territory, almost completely neglected, is the examination by means of mental tests of the mental processes characteristic of old age. We are too much concerned with our infants and our adolescents to spend time on the senescents, but it would not be surprising if the intensive mental testing of individuals would lead future investigators to entice octogenarians into the laboratory. Perhaps we might then find mental tests of use in settling once for all the question raised by Dr. Osler—which is beginning to worry some of us—whether we are really ripe for the chloroform bottle at sixty!

The Development of Methods of Group Examination of the Intelligence of Adolescents

GUY M. WHIPPLE

Up to two years ago almost no attempt had been made to apply mental tests systematically to high-school students and to relate the results to school performance and other indications of general intelligence. The reasons for this situation are not far to seek: intelligence testing received its greatest impetus from, and has been most earnestly prosecuted by dint of, the Binet-Simon tests, and these tests, as all users of them know, become distinctly less reliable and effective as we go beyond the ages of ten to twelve years. In fact, of course, Binet himself never made pretense of testing adolescents with his scale. Only in the quite recent Stanford Revision, extended account of which appeared in 1916, has there been anything like serious attempt to carry the Binet scale upward into the period of adolescent and adult life, and it is not entirely sure yet how accurate and how serviceable this extension may be.

This lacuna in our methods of mental testing is the more serious in that just in the adolescent period is it especially interesting to secure knowledge of the distribution of general intelligence and to measure the amount of it possessed by individuals, because it is in the high-school or upper grammar-school period that attention is given to the selection of a vocation in which process there is probably no other single factor anything like as intrinsically important as degree of general intelligence.

To this it has to be added that the establishing of standards of performance in mental tests is more difficult for the high-school period than it is for adults, because presumably adults may all be rated on the same distribution, whereas high-school students are still in the process of mental development, so that standards and distribution of test results that will serve for freshmen will not serve for sophomores nor these for juniors or seniors.

Because, then, of these difficulties the devising of mental tests for adolescents has been somewhat neglected, tho much to be desired. With this thought in mind I encouraged Mr. W. S. Miller, of the School of Education at the University of Illinois (some of you will recall that Mr. Miller took his bachelor's and master's degrees here at Indiana University) to undertake for his doctor's thesis the application of a series of mental tests to several hundred students of the Urbana (Ill.) high school, with reference in particular to the establishment of standards of performance and of examining the relation of performance in the tests to age, sex, class in the high school, school marks, and other factors. Again, last year, as I have described in another address here, I had the privilege of being associated with a number of my colleagues in the Committee of the American Psychological Association on the Mental Examination of Recruits, and yet more recently, three months ago, of assisting in the last revision of this series of tests. From the work that I watched in the preparation of Dr. Miller's dissertation and the observations I made on the outcome of the army tests, I have formed a number of ideas about the use of group tests of adolescents and adults which I shall endeavor to put before you this morning.

To begin with, why use a group test at all? I have always been of the conviction, and my conviction is quite unshaken, that the ideal method of testing mentality is the individual method. If the object of testing is to arrive at a fairly thoro knowledge of the examinee's mental make-up; if it is proposed to use the results of the examination diagnostically and prescriptively, I can see little excuse for failing to conduct at least some part of the mental testing by individual examination. Individual examination permits the examiner to make the acquaintance of the examinee, to watch his manner of response to the tests (a matter of very great significance), to correct wrong impressions in him as to their significance or importance, to note failure to understand instructions, to permit second trials in some instances, to detect cheating and malingering, to get suggestions for the best ways of extending the examination profitably—in short, it permits the examiner to keep his eyes on his instrument. Furthermore, individual testing is often the only feasible way to bring it about that each examinee really works thru the whole test, which I regard as desirable under most conditions.

There is one primary argument in favor of group examination—economy of time—but we psychologists are working with a delicate device and striving to understand an extraordinarily intricate affair, and there are many problems of mental testing in solving which we cannot afford to throw aside any of the advantages that careful procedure would insure. To use the group method when important diagnostic testing is in progress on the ground that it saves time is, as Dr. Bobertag remarked to me, "as laughable as would be the defense of a chemist that he distilled several different fluids under analysis in the same flask to save time". At least this much may be said: when group testing is more or less inevitable, it is well to supplement by individual testing, either by applying individual tests to all those examinees whose results deviate much from the central tendency or by retaining one test as an individual test to be thus applied to all examinees who take the group tests. This latter method was tried by Miller in his work at the Urbana high school and proved easily worth the extra time (probably about one hundred hours) it consumed. Thus, in his investigation, the cancellation test, the hard directions test, the word-building test, and the two tests of logical memory (the Dutch Homestead and the Marble Statue tests) were given to the students in groups of ten to thirty, as fitted the convenience of the school's schedule (and let me point out parenthetically that when the size of the group increases above twenty-five to thirty students the difficulty of handling any test by the group method increases also); the analogies test and the cause and effect test were given individually.

Assuming that economy of time makes group tests imperative or that adequate arrangements are made to supplement them with individual tests, let us next notice some of the qualifications or criteria that group tests ought to meet.

1. It is important to take special precautions in introducing the tests to get the examinees properly "set" or "attuned" to the work, to engender a good morale. The thing to avoid is that any examinee shall be timid, panic-stricken, indifferent, sullen, contemptuous, or derisively amused. The thing to secure is respectful attention, cheerful interest, and an earnest ambition to do well what is required. Much depends on the words that are used to introduce the whole matter and perhaps as much again upon the "personality", to use that much-abused term, of the examiner. I have seen perfectly intelligent graduate students, armed with printed directions, fail utterly to get the respectful attention of a group of army recruits, and seen the next man, armed with the same words of instruction, "put across" the entire test with marked success. You know the difference as well as I do; one man can sell his goods; the other can't. In group mental examination work you must "sell" your audience the idea you are putting before them.

2. It is important that instructions for each test be made as nearly "foolproof" as possible. In giving individual tests the examiner can usually readily detect misunderstanding of the directions for undertaking the test. In the group test every case of misunderstanding is disastrous. It usually means that the record for the examinee in question must be thrown out. Moreover, for every examinee who fails to do the test at all or who raises his hand and asks for information after the rest have begun work, there are doubtless a number who conceal their misunderstandings of instructions.

In our work with the military tests we spent, I believe, almost more time in perfecting the instructions than in getting together the material for the test itself. When the instructions had been revised after the first trial we supposed that we had approached a satisfactory arrangement. But in our Test 3, known as the Rearrangement of Sentences, nearly thirty-three per cent of the enlisted men and a small percentage of officers made a zero score because they could not understand the instructions. It is hardly necessary to add that when preparing a group test the directions for each test must not only be prepared with care, but must also be tried on a sample group of examinees and then revised until there are practically no failures from misunderstanding; if this point cannot be reached, the test in question must be given individually.

3. One way to secure better understanding of the task in tests that are to be applied by the group method is to prefix samples that are properly worked out. This may be done by blackboard demonstrations or by samples printed on the test blanks themselves.

4. It is well known that tests that are too easy and tests that are too difficult both fail satisfactorily to bring out individual differences in

a group of examinees. If too easy, many persons obtain a perfect score so that differences that really exist among them fail to appear; if too difficult, many persons may obtain a zero score, so that, again, differences that really exist among them fail to appear, and, moreover, this failure to accomplish anything produces dissatisfaction, if not active resentment against the testing and the examiner who is responsible for it. In individual testing there is enough flexibility to enable the skilful examiner to meet these extremes of ability, but in the group testing these extremes must be provided for, if possible, in one and the same test. One way to make this provision is to be careful to have some very easy tasks and some very difficult tasks in the same test. Actually, it is worth while to go farther and to try to secure an order of arrangement of items within the test such that the difficulty is progressive. Ideally, perhaps, the first task should be so simple that any person who had understood the directions at all could not fail to do it, while the last task should be so difficult that only one or two of the best persons in a hundred could do it.

In constructing the army tests we tried to follow this general idea. Thus, in the arithmetic test, the first problem was of this sort: "How many are 50 guns and 4 guns?" while the twentieth was of this sort: "A commission house which had already supplied 5,234 barrels of apples to a cantonment, delivered the rest of its stock to 28 mess halls. Each mess received 14 barrels. What was the total number of barrels supplied?" And in the memory span test (now discarded) the first task was of this sort: "Listen to these figures—4 1 8; now write them"; while the final task was of this sort: "Listen to these figures—4 1 9 7 2 5 3 6 0; now write them." Despite our precautions, we found in arranging the last revision that we needed in most of the tests to make the earlier items easier than we had and to make the final items harder than we had. In the new group tests the initial tasks are very easy and the final ones very hard.

5. Another obstacle offered by the group method of testing is that of recording speed of work. Ideally, since the various items in a test are bound to vary somewhat in difficulty, even when we try to make them equal, it is best that every examinee should proceed through the entire test and that his speed should then be directly measured in terms of the time that he needs. In group testing this method may be followed provided it proves feasible either for the examiner himself to watch each examinee and make a memorandum of the time or for the examinee to be trained to read the time in minutes and seconds from the special type of large clock. In the Urbana high school group testing we tried the latter method. Each group of students was practiced for about two minutes in reading the dials of the seconds clock. The results were quite satisfactory, and I am inclined to recommend that method when reliable examinees can be given the preliminary practice with the seconds clock. In the work we have done with applicants for positions as salesmen, we have arranged our tests so that the primary factor in the score is quality of work with a bonus for extra fast work. Each test is supposed to run for a given time, say fifteen minutes; if any person finishes before that time, the examiner collects his paper, marks the

time roughly in minutes, and credit is given according to the number of minutes gained over the time allowed. The method has the merit of simplicity, but it sometimes results in confusion in the room, and I believe it is quite undesirable, if more than twenty to thirty persons are tested at once, to have anyone get out of work, because it is almost impossible to prevent whispering, comparing of papers, scrutiny of the work of others, and similar things that disturb the whole test.

Another way out of the difficulty is to give up the attempt to record the time of each examinee and to compel each one to work for the same length of time—to use what I term the time-limit in place of the work-limit method. I hardly need point out that this plan chimes in well with the plan of having progressive difficulty of items that was just explained. This combination was tried in the military tests, despite some objection at first on the part of one or two members of the committee. I am sure that everyone is convinced now, at least I am, that any other plan of handling fifty to eighty-five recruits at a time would be impossible.

As to what actually shall be the time limit selected for a test, that must be determined by trial. The principles involved are fairly obvious: the time must be long enough so that everyone can do something with the test; the time must be short enough so that only a few exceptionally good men can finish it. You can see how this provision dovetails in with the provision for progressive difficulty of items. By stiffening up the last ten to twenty per cent of the material in the test the good men are prevented from finishing too soon and this gives the poor men a chance to get reasonably well into the easier part of the test.

6. It is probable that in any collection of group tests for measuring general intelligence of adults there should be included one or more tests in which no premium is placed upon speed. The question: "How significant is speed for intelligence?" revealed diametrically opposed views in the military tests committee. Some thought that speed of meeting the characteristic problems of the mental tests was the one primary thing that revealed degree of intelligence; others thought that there were many men, "slow-intelligent" they termed them, whose ability to deal with problems and to meet situations intelligently was high, but who needed more time for this than did other men of the "quick-intelligent" type. Our discussion was compromised by arranging for two examinations; the regular examination was frankly a speed test; men who obtained low scores in that were then given an opportunity to take substantially the same tests again (with subject-matter altered) with an allowance of one hundred per cent more time. I regret that I have no precise information as to the outcome of this arrangement, but I think I am correct in saying that very few of the men who got a low score under limited time showed appreciably better records when permitted to take the tests in a more leisurely manner. However, there are certain types of tests in which there seems to be no particular logic in putting a premium on speed. For example, in tests wherein information is the prime requisite. Thus, in the military tests is included one which asks for such information as the source from which cider is made, the location of the liver, the number of cylinders

in a Cadillac, the name of the president during the Mexican War, the field of activity in which Edison is famous, etc. *A priori*, it would seem to make little difference for practical diagnosis of general intelligence whether the examinee could indicate his knowledge that the liver is in the abdomen, not in the neck, in one second or two seconds. In the last revision of the military tests we have lengthened the time given to the information test with the idea of permitting a greater number of the recruits to work farther down the page of tasks. Personally, I don't believe that this change will produce any perceptible change in the order that men assume in the final score, but it may be worth while for the sake of the attitude of the examinees to include in tests of intelligence some assignments in which they are expressly informed that there will be time for practically everyone to complete the test.

7. In individual testing it is usually desirable that the examiner should take upon himself the labor of recording the examinee's responses, especially when these are verbal and when they are at all extensive. In group speed tests we must be careful not to impose too much writing, and if the examinees are not school pupils, accustomed daily to written assignments, we would better reduce still further the amount of writing. Thus, in the event that adults of varying degrees of linguistic ability are to be tested, written responses should be reduced to the minimum. This principle was carried out in the group tests arranged for army recruits. Making a cross, crossing out a letter, underlining a word or a number is the only thing done with the pencil in the army tests, with the exception of the figures that have to be written in recording the answers to the problems in arithmetic. This means that no time is lost on the part of examinees who write slowly or who would have difficulty in spelling, while no time is lost by the examiners in deciphering illegible and misspelled responses.

In order to carry out this principle some very decided alterations had to be made in the form of presentation of many of the tests, and it was partly on this account that it was so difficult to predict to just what extent results with these new forms of tests correlate with results obtained with the old and standard forms. In illustration, one of the best known, most used, and most useful tests of general intelligence is the opposites test. As commonly administered, the examinee receives a printed list of terms, like *alive, sacred, inside, white*, etc., and is asked to speak or write as rapidly as possible the exact opposite of each. He responds *dead, profane, outside, black*, etc. Sometimes for a variant a test is used in which the examinee is asked to give synonyms instead of antonyms. These tests would have to be rejected from a list of group tests for adults or adolescents if we cling to the principle that no writing of words is to be demanded. This difficulty has been surmounted in the army test by making a combination synonym-antonym test. Forty pairs of words are presented to the examinee, for instance, *good-bad, little-small*, and so on. Over against each pair of words are printed the two words *same* and *opposite*. The instructions become, then, in substance: Look at this pair of words, *good-bad;* if they mean the opposite, draw a line under *opposite;* if they mean the same, draw a line under *same*. Thus, we retain the valuable idea of compelling the examinee to consider the verbal relations of likeness and opposition and at the same time relieve him from all writing. Of course, at the same time, the task of deciding whether a given pair of words are opposites is not the same as the task of finding in your own mind the opposite and recording it, and for that reason it was not possible to know beforehand whether the modified synonym-antonym test would be as useful for indicating degree of general intelligence as the original opposites test had been.

Similarly, it was felt desirable to have a test of common sense. You are most of you familiar with the Binet questions of common sense that start off with the phrase: "What is the thing to do if . . . . such and such a condition exists?" This idea was adapted to our plans in the following way: A series of questions was drawn up, like "If a man who couldn't swim should fall into a river, what ought he to do?" "Why are high mountains covered with snow?" etc. Then to avoid the written response, a series of four responses was framed up; one was the correct response or the best one; the others were less sensible or even positivly absurd. All these were printed after the question and the examinee had merely to put a cross in the square against the answer he voted for. Thus: "If your gun explodes during an engagement what should you do?" Responses: "Throw it away and get another," "Keep it to use as a club," "Take it apart and save the undamaged parts," "Try to fix it." This particular item in the common sense test proved to be ambiguous, and that is the reason I feel at liberty to use it here, where I feel under obligation not to give away any information about the military tests that could be of value to friend or enemy.

The well-known and useful analogies test was converted to a group test with no writing, by printing four responses and requiring the examinee to underline the one he deemed correct. Thus, instead of presenting "fish-swims: man—?" and requiring the examinee to figure out the required fourth term *walks*, the test appears in the form "fish-swims: man—(boy, woman, girl, walks)" with the request to underline one of the four terms in the parenthesis. If the analogies test in this arrangement proves as useful as it does when applied individually with oral responses and accurate stop-watch timing, then we shall have been able to make a great advance in economy of time in testing, without sacrificing the diagnostic service that we desire to conserve.

8. Thus far I have spoken of arrangement of material and methods of presentation. There remain a few principles to mention that govern the choice of tests for the group examination of adolescents and adults. One of the obvious ones is economy of time. We institute group tests just to gain this very thing; we throw away much of what we seek to secure if we introduce tests that consume much time. The difficulty is more serious, in a way, with group than with individual tests, because it is difficult to assemble a group (especially a group of adolescents or adults) twice, and it is not usually desirable to extend the time of testing longer than an hour. The problem then is: How can I most effectively use sixty minutes to measure general intelligence? On this basis, of two tests that promise about the same efficency, that one is to be preferred that takes less time to administer. One of the reasons for ex-

cluding our memory span test in the last revision of the army tests lay in the length of time it consumed, tho there were other cogent arguments against it (such as likelihood of error on the part of the examiner, failure to correlate well with estimated intelligence and length of time needed for scoring).

9. The point just mentioned parenthetically deserves, perhaps, mention as a separate principle in the selection of group tests, that is, of two tests that promise about the same efficiency, that one is to be preferred that takes less time to score and is less likely to be scored wrongly. You will understand that this matter of scoring becomes serious when group tests are applied to large numbers of examinees. Thus if one hundred persons are tested, and the scoring of one test takes five minutes per paper when an equally effective test could have been used at that point that could be scored in one minute, the time lost by the use of the slowly scored test would amount to some six hours and a half a day—no inconsiderable item. In the cantonment work, when the number of papers to be scored runs into the hundreds of thousands, you can see by a little mental arithmetic how much time is gained by gaining even a few seconds per paper.

10. Another difficulty arises in the use of group tests that seldom bothers the individual tester—I refer to cheating and malingering. There are a number of things that can be done to reduce the amount of cheating in group testing. (*a*) The examiner can put a stringent ban on cheating in his introductory remarks—possibly with threats of penalties for any suggestion of cheating. (*b*) The examination room can be "policed" by assistants or orderlies whose business it is to watch the men under test and who are instructed to step forward at once and place a cross or other significant mark on the paper of every man who seems to be cheating. (*c*) The examinees can be seated at distances from one another that preclude copying. (*d*) The tests themselves may be so selected or so printed that cheating, at least by copying, is difficult or impossible. Cheating by getting hold of the tests beforehand and priming for the examination may be reduced by examining all the individuals in a given area in one day or by providing four or five equivalent sets or forms of the tests and changing the form in use at stated intervals. This was the plan used in army testing, where four or five complete sets of tests were devised, with the idea (which was approximately carried out at least) of making each set equivalent in difficulty to every other.

Generally speaking, we found that we had overestimated the likelihood of cheating or at least the amount of interference by it in the results. You see, a man who can pass the tests with a high grade has little motive for cheating and is as a rule probably less likely to have the temptation occur to him or to act upon it if it does, while the man who can't pass the examination is too stupid to get together information about it or to use it skilfully if he can secure it. As a matter of fact, the enlisted men were apt to leave the examination room in a more or less of a daze so far as the details of the examination were concerned; when quizzed by their mates, apparently they could give them only scattering and inaccurate information as to what it was that they had just been doing. The only serious attempts to make up outside the walls of the examination room a sort of replica of the examination appears to have come from groups of officers, who attempted it more as a matter of interest in the tasks than with the intention of helping their fellow-officers to get thru next day.

As for malingering, deliberately trying to do poorly or to feign ignorance, this is a rare occurrence, and arose, so far as my information goes, only in a few instances in our army tests when men thought that by pretending to be feeble-minded they might be discharged from the army. These cases were remanded for individual testing and were quickly detected by applying scattered items from the Binet tests; to malinger successfully here the examinee would have, you understand, to know just which questions he ought to fail on and which to pass, whereas in his ignorance he passes some ten-year-tests and fails on some seven-year-tests and thus falls a victim to his own devices.

Thus far I have tried to present some of the advantages and disadvantages of group testing and to enumerate certain principles of procedure or of test construction or of test selection that I feel should be observed in mentality testing of this kind. Some of you may now be interested to know just what tests were selected for the examination of adults in the army and perhaps also to hear something of the results obtained in our testing in the Urbana high school.

The group examination that was used in the four army cantonments during the fall and winter began with a directions test of new design. It called for the giving of a series of directions, orally, by the examiner, in response to which the recruits were to perform some simple act with their pencils on the first page of the examination form, as, for instance, "make a cross in the second square; cross out all the numbers in the sixth line that are less than 100 and not over 200," etc. You will see that this test might be thought of as a sort of memory test; it also is similar in some respects to the easy and hard directions tests of Woodworth and Wells; it may also be thought of as a measure of the capacity of the recruit to listen to some instructions and proceed to carry them out. You will understand from what I said before that the first instructions were easy, the last quite difficult.

The next test was one already mentioned—memory span for digits. It began with three figures and proceeded to nine. It has been thrown out of the latest edition of the tests.

The third test is akin to the disarranged sentences test found in the Binet scale. A set of words is presented, like *morning the rises every sun* with the request to think what they would say if they were put in order to make a sentence; the examinee then underlines for each of these arranged sentences the word *true* if the mentally reconstructed sentence would be a true statement, or the word *false* if it would be a false statement. Of course, the words are arranged so that part of them would form true, part of them false statements.

The fourth test is made up of the twenty problems in arithmetic to which reference has already been made.

The fifth test is the test of information, also previously referred to. Here there are forty sentences, each in the general form illustrated by this sample: "People hear with their—eyes, ears, noses, feet," and the examinee is directed to underline that one of the last four words that makes the truest sentence. More difficult matter of information can be arranged in the same pattern, e.g. "The reaction of the saliva upon starchy food left upon the teeth causes their decay by the formation of—ammonia, flour, sugar, glycogen." You can amuse yourself by inventing similar sentences to make information tests, and I am not sure that you might not find the device a useful one for preparing rapid written tests in the classroom.

The sixth test is the synonym-antonym test, and the seventh the common sense test, the ninth the analogies test, all three of which I have already sufficiently described.

The eighth test was an attempt to measure capacity to generalize. The idea was to put before the examinee a series of numbers, like 12, 14, 16, 18, 20, leaving a dotted line on which the appropriate next number, here 22, should be written. You can see that series of very difficult pattern may be devised, like 2, 4, 6, 12, 14, in which the key is multiply by two, add two, multiply by two, add two, etc. This test is rather hard to explain in group testing. Our new instructions depend less on verbal explanation and more on preliminary samples; several other modifications have been made in the hope that we may get more useful results from this test, the general idea of which is rather attractive.

The tenth test demanded of the examinee that he underline the largest number and also the smallest number in each of several columns of numbers. The results were not specifically satisfactory, for instance, high-grade feeble-minded (morons) got scores as high as forty out of a possible one hundred points. The test is not in use in the latest revision.

This elimination of two of the ten tests that were originally used raises another question about group testing of the intelligence of adults and adolescents that is not unimportant, namely: How many tests are needed and how long a time is needed for a satisfactory examination?

The original ten army tests occupied forty to forty-five minutes. The discarding of two tests will somewhat reduce this time, possibly five minutes. Forty-five minutes seem entirely reasonable for work of this degree of importance, especially when groups of fifty to eighty-five men are handled at each sitting.

Scrutiny of the scores indicates, what might have been anticipated, that even in this relatively short examination, we probably have more tests than we need—for the particular purpose, of course, for which they are being used. It remains to be seen whether it would pay to reduce the number; there would be a saving of time in administration and more particularly in scoring and tabulating the scores; on the other hand, reduction beyond a certain point would increase the unreliability of the series. I cannot say at this moment where that point lies. It is sufficient to say that in a period of less than forty minutes a group of adults who have never before heard of psychology or mental tests can be tested and classified as to their general intelligence into four or five groups with no serious amount of error, provided all extreme cases are given a secondary examination, preferably an individual examination. This I regard as the most obvious single contribution that the military testing has made to our outlook for group testing of adults.

A private in the general army averages about from 12 to 13 mental age. In the army the maximum score was about 400 points. A score of 100 points represented roughly the mental age of 10 years—each year above and below added or subtracted about 25 points. The privates averaged from 140 to 180 points—the mental age at about 12 to 13 years. Officers averaged from about 260 to about 325 points, and in the cantonments originally tested it turned out that the officers in the engineering regiments made, taken as a group, the best scores, those in the artillery and infantry next, quartermasters corps next, and then the dentists and surgeons. Interesting scores have also been obtained showing that the average general intelligence of some groups of negro privates is in the neighborhood of 50 points. The lowest record for any white officers runs over 100 points. Beyond that probably I had better not go on talking about the army tests. Nor will time permit my presenting further details of the group testing in the Urbana high school of which I had hoped to speak, save to explain the composition of some of the charts that hang before you.

[Dr. Whipple closed his address by explaining certain features of charts that showed the relation between the analogies test and estimated general intelligence and between that test and achievement in high school alegebra.]

Tests for Vocational Selection

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Fellow Teachers, they have burdened me with a rather hard task this afternoon. Tomorrow I have some really exciting facts to present, but all that I have this afternoon is a steady, solid, not to say critical and analytic account of a hard technical problem.

First of all, it must be admitted that there are almost no demonstrated facts about the results of any test of vocational aptitude as used in actual practice. A few such tests have been devised; of those a few have been tried out in actual prophecy of fitness or actual selection of individuals; and of the very few which have been tried out still fewer have been followed up by any full or subsequent history of the individuals who were measured. With very few exceptions, then, knowledge about tests of fitness is indirect. It is the result of putting together this, that, and the other fact, often offered from widely different sources. I can illustrate that by our experience in an allied problem in the army.

There is, as many of you know, a scientific civilian staff of the committee on classification of personnel in the army. We found at the end of September about fifty skilled trades required by the army for its military work. By Thanksgiving we found there were about two hundred, and on the sheet I have before me, which is the latest report, there are over four hundred. We have been selecting men on the basis of achievement in those trades more or less formally thru personnel adjutants in the various cantonments. In the meantime, since the end of October, we have been trying to work up actual tests, not of vocational aptitude or capacity, but in the much easier case of vocational achievement—tests that would tell, for instance, when a man claimed that he was a skilled mechanic whether he was what he claimed to be or only a machine hand. We have had, I suppose, an average of eight or ten persons at work trying to devise tests of achievement with the thirty or forty most important of these trades. We haven't tried to test specialists in scenery or dog-trainers, which are on the list, but just some of the ordinary vocations—carpenters, blacksmiths, automobile repair men, magneto men, and so on.

We found it extremely difficult to get tests, even with the kind cooperation of manufacturers and foremen and the kind assistance from many quarters, that would adequately distinguish the expert, journeyman, apprentice, and novice in these trades after they had been supposedly submitted to special training in it. You may expect it to be very much harder to find tests of vocational aptitude so as to prophesy, before the person has come in contact with the trades, how well he *would do* if he *should have* a certain amount of training in them.

Obviously such tests are needed. They may be needed in the army because the actual tradesmen may be used up so that we may have to face next a problem of picking out the kind of young men who can be sent to train to be an aeroplane mechanic or a rigger of aeroplanes and the like. They are certainly needed in education. Every one of you with the interests of boys and girls at heart would like, if you could, to direct their selection of a vocation. You would like, if you could, to find tests that would help you to aid them in their vocational selection. The whole subject of vocational aptitude and vocational selection, however, is certainly one of great difficulty.

In giving vocational counsel we shall meet problems that will range from very narrow ones to very broad ones. At one extreme are boys asking, "Shall I sell shoes or shall I sell hardware?" and girls asking, "Am I better fitted to be a dressmaker or a milliner?" "Will I do better as a clerk in a real estate office or in a lawyer's office?" Shall I raise chickens or raise ducks?" At the other extreme will be pupils asking, "Shall I go into office work or factory work?" "Ought I to learn a trade or go into business?"

With respect to the fine distinctions, the choices between closely similar activities, to minute specialization, it may be said once for all that almost no tests are available—very few could be made available within any reasonable time. Moreover, those that could be made available would in few cases be suitable for administration save by specialists in applied psychology. There are, it is true, individual differences whereby one person is qualified to do one particular sort of specialized task, such as testing ball bearings, or punching cards for a Hollerith tabulator or repairing magnetos. And with sufficient genius and research, tests can be devised which will be symptomatic and prophetic of these particular concatenations of abilities.

For a full equipment of such tests, however, fitted to the thousands of specialized tests, we must naturally wait. And until means are at hand for answering broader questions we may wisely wait, for these are obviously more important and deserve attention first. Finally, the school principal or superintendent, acting as general advisor, could not possibly become versed in the nature, meaning, and use of a thousand tests for specialized aptitude, even if they were available.

In saying that the broader questions are obviously more important I have implied that the welfare of a nation rather than the prosperity of some private employer will be the aim of whatever vocational guidance and selection we do. A private firm selecting girls to inspect cartridges for size and smoothness may care enormously for two special tests of those abilities and for a differential test to decide whether a given girl shall be set to work as inspector for size or for smoothness. The firm may care very little whether the girls who apply for employment are better fitted for routine factory work or for the career of a trained nurse. In its private capacity the firm has little or no interest in what its employees would do if they were not its employees. The commercial demand is consequently often for tests of very specialized ability and very close distinctions. The general national demand is for tests to help decide big sweeping questions.

A few samples of these might be mentioned. Is the individual capable at all of learning a skilled trade? Will this individual profit by a professional education? Is this other individual better fitted for manufacturing or for selling? Is this last individual wise in his choice of farming rather than business? To find the correct answers to such questions as these, to direct individuals aright in the main course of their training and early life work, to prevent gross misfits—these would be the main services of teachers and principals as vocational counsellors.

These large sweeping choices are roughly of two sorts. First, there are the choices between varieties of work, as between farming, factory, and trade work; office and clerical work; selling; one of the professions, and the like. Secondly, there are choices between grades or levels of work demanding greater and greater ability or greater and greater preparation or both, as between being a farm hand, a small-farm owner or manager, a large-farm owner or manager, a county agent, or a consulting agricultural expert. In the case of factory work we have a gradation from a mere laborer thru machine hands of various grades up to skilled tradesmen of various grades, to high-grade mechanics, tool-makers, and so on to the professional classes such as engineers, shop managers, efficiency experts, and the like. In the case of business the gradations are subtler and more complicated but no more or less real.

We may then roughly map out the vocational offering as a series of columns like farming or office work or factory work or railroad work, each column consisting of a number of levels demanding increased ability and training. A part of such a map might be that shown here:

Farm Work

Chore man
Farm hand
Skilled farmer
Foreman
Manager
Large-farm manager

Office Work

Clerks engaged at narrow mechanical routine (e.g. envelope openers)
Clerks engaged at broader routine (e.g. typists or form letters)
Stenographers, filing clerks, and the like
Bookkeepers
Confidential stenographers, secretaries, chief clerks, and the like
Office managers, cashiers, and the like
Actuaries, secretaries of large corporations

Selling

Store helpers, delivery boys
Salesmen in small stores and the routine salespeople in department stores
Traveling salesmen
Traveling salesmen, higher grade
Sales managers

Buying and Selling

Pack pedlars, push-cart owners.
Large store owners or managers, department managers
Wholesalers
Real estate operators
Speculative traders

It will be understood that no such simple map can be strictly accurate. The complexity of the organization of the world's work is far too great.

In particular, what are listed as the upper grades of the same variety of work often are not of the same, but are complicated by new and special executive or managerial abilities.

Let us, however, leave all such obvious inadequacies for the present and accept as a rough working hypothesis the plan of varieties of work each represented at different levels.

We then have two main questions. The first is, What variety of work should the boy or girl in question choose? or, At which variety of work will he serve the world better? or, Under what column shall he enlist in the nation's economic army? The second question is, What level of work may he wisely expect to reach? or, To how exacting and responsible a position should he aspire? These should be the two fundamental questions in our mind as we give him counsel.

Can any tests be found or devised to help us make answers to these questions truer than we should otherwise give?

Consider first tests relevant to the variety of work that should be chosen, taking for illustration clerical or office work, the mechanic arts and trades, and selling.

Some of the qualities related to success in these three trunk lines of vocation may be reached and evaluated by tests which duplicate in a rough way the performances required in the vocations themselves. Suppose, for example, that fifty boys in grades 8, 9, and 10 were given on successive Mondays instead of their regular school work these three following programs:

Clerical Capacity Test

1 hour. Hunting names in a directory and copying the addresses.

1 hour. Sorting cards according to the names, dates, place, sum of money, etc., etc., printed on them.

1 hour. Tabulating on sheets, according to a plan, the facts from similar cards or from application blanks, order slips, or the like.

1 hour. Comparing pairs of names, dates, numbers, and the like, checking any that are unlike.

1 hour. Arranging neatly a drawer full of mixture of letters, cards, slips, pens, blotters, etc., etc.

1 hour. Of clerical errand work in response to oral or printed directions such as:
Look at these numbers: 6 4 9 3 7 4 5 2 0 4 7 6 4 9, etc.
Draw a line under every 4 that comes just after a 7.
Draw a line over every 3 that comes just between 8 and 9.
Look at these words and numbers:
Write in the left-hand margin every name of a person.
Write at the bottom of this page every number above 6,000.
Look at these pages of advertisements. Cut out neatly all the quarter-page advertisements and paste them on one large sheet.
Do the same with one-eighth page advertisements.
Read the letters marked A 4x and write at the top of each the sum.

Mechanical Capacity Test

1 hour. Filing a blank to make a duplicate for a given key.
1 hour. Assembling parts to make mechanisms, as in the Stenquist tests.
1 hour. Whittling and sand-papering pegs to make exact fits for holes.
1 hour. Work with saw and chisel and hammer on a braced door or gate.
1 hour. "Make what you like" with certain given materials, as in the Kelley tests.

Selling Capacity Test

2 hours. "Play" selling to business men and teachers who will act as judges of selling ability. Ten minutes may be allowed to each interview, and forty minutes to a previous study of the "goods". These should be some suitable article. The prospects should rate each pupil by a defined scale.
2 hours. Real selling, as of tickets, subscriptions to a school paper, or the like, the "territory" being equalized as to promise. The selling campaign and arguments should be furnished by the teacher in the same way that they would be furnished to salesmen by a sales manager.

For our fifth hour we attempt to get a summary of what abilities the pupil has by recording the impressions which his classmates have of him. We ask each pupil to rate everyone in the class for popularity, for quality of voice, for personal presence, and so on with other qualities, and submit these ratings to suitable statistical treatment. The opinion of schoolboys and schoolgirls of course is not final, but the average opinion of thirty schoolboys in the fourth year of high school, concerning the popularity, or the personal magnetism, or the voice, or the personal appearance of his fellows is by no means to be despised. They are after all not such bad judges of character and we may well devote an hour to using their knowledge.

Suppose now that Arthur Adams, Bert Bunce, Charles Conroy, and others have scores such that Adams is the best of the group in the clerical test, the twenty-second in the mechanical test, and the forty-first in the test or pseudo test of selling, as shown in the table:

		RANKS	
	Clerical	*Mechanical*	*Selling*
Arthur Adams	1	22	41
Bert Bunce	38	12	46
Chas. Conroy	11	18	1
David Downey	50	30	45
Edward Evans	30	29	28
Fred Faver	2	4	3
George Godfrey	46	44	47

How much confidence may we have that Adams is better fitted for clerical work than for a mechanical trade or selling, that Bunce is better fitted for mechanical work, that Conroy is better fitted for salesmanship? Nobody knows precisely but it seems safe from experiences gathered here and there, to expect that these scores, properly used, will at least greatly improve the advice we give these boys about the selection of a vocation and the advice we give employers about their selection of these boys.

One of these series of tests in a different form has been fairly well tried out and seems to have succeeded. That is the test for clerical promise. A test of this type installed by the Metropolitan Life Insurance Company has been in successful operation for three years, providing the company with workers such as it requires and providing girls who wish to find out whether they are suited for clerical work a chance to do so, thus satisfying both the employer and employee.

We must bear in mind that a test does not have to be infallible to be useful. It has only to cause an improvement over what would otherwise be done. Tests representing the general features of the performances characteristic of the vocation, arranged so as to result in a definite score such as can be compared with the scores of other individuals and with various standards, seem sure to be of help. Such tests could be arranged as to details of administration and in part tested out with say one thousand individuals of known success in clerical and mechanical and selling work in the course of six months and put to service in the schools if that were desired.

Instead of thus building up a test of the sorts of performance characteristic of a vocation we may try to list the essential qualities of body and mind which are measurable. We could then make an inventory as it were of any boy or girl, and from the inventory estimate vocational fitness. Something of the sort can obviously be done. Ability to stand eye strain in near vision work is valuable to a clerk but of no value to a salesman. A pleasant voice or impressive appearance is of little value to a clerical worker, but of much value to a salesman. Muscular skill means in general more for a factory and trade worker than for a clerical worker or a salesman.

If we should set a staff of physiologists and pyschologists at work to describe exactly the make-up of ten thousand or more individuals of known opportunities and known achievements in the world and submit the result to a thoro analysis, we could perhaps, in six months or a year, make a substantial beginning of a series of tables of credits after some such pattern as this:

16-YEAR-OLD MALES

Pound weight per inch of height	*Clerical Work*	*Mechanical Work*	*Selling*
For each pound under 18.............	—1	—3	—2
For each pound over 27..............	—1½	—2	—2
For each grade reached less than 10..	—30	—16	—20
For each grade reached above 10.....	+20	+8	+10
Quality of handwriting at 100 letters per minute (copying) for each point below 12 on the Thorndike scale	—4	—1	—1
For each point above 12.............	+4	+1	+½

The analysis required would, however, be extremely intricate and laborious, because a certain quality may possess efficacy in accordance with the support which it has from certain complex configurations of other qualities. Also, a sound procedure would require very elaborate experimentation in the way of changing persons of known make-up about from one vocation to another and measuring the consequences. So, altho it would undoubtedly be greatly to the nation's advantage in the long run to make such inventories and correlations, we could not expect much for immediate use.

A third group of tests worth consideration concern interests, inclinations, and proclivities, what Professor Woodworth has called the "drives" of an individual. Thus, it would be easy to have a group in grade 8 or 9 or 10 report their order of preference for such work as they have done at home and school, using some such form as this:

Write your name and age here.

Name ....Age.............

Read everything as far as Table 1, before filling out Table 1. Then read again as you need and fill as directed.

Consider your interest in, or liking for, each of the activities listed below. Mark under *Interest* with a 1 the activity which was the most interesting to you of the seven listed. Mark with a 2 the one that was next most interesting; mark with a 3 the one that was next in interest; and so on. If two or more were, so far as you can judge, equally interesting, give them the same mark.

By *Bargaining* is meant swapping, trading, buying as cheap as possible, selling as dearly as possible, and the like.

By *Managing people* is meant bossing others, giving orders, deciding which person shall do each part of a game or task, persuading people to do certain things, getting people to agree and the like.

By *Studying with books* is meant studying, but *not* experimenting in a laboratory, learning to use machines, or observing facts in nature.

By *Clerical work* is meant such work as arranging cards, comparing names or numbers, classifying written facts of name, number, date, address, and the like.

By *Mechanical work* is meant carpentering, blacksmithing, cleaning tools or machines, and the like.

By *Farm work* (not including care of animals) is meant chopping, hoeing, ploughing, digging, moving stones, planting, and the like.

By *Work with animals* is meant care of poultry, lambs, etc., feeding, harnessing and driving horses, and the like.

TABLE I

	INTEREST
Bargaining	....
Managing people	....
Studying with books	....
Clerical work	....
Mechanical work	....
Farm work	....
Work with animals	....

It would be easy to have them report what sorts of work they have done for pay, and which sort they liked best, second best, and so on. Their likings for studies, games, books, amusements, and other activities can also be recorded.

Such reports of preference are, of course, subject to errors of many sorts, and, like any facts about human nature, should not be overworked. Nevertheless, they possess real value. In spite of the errors due to inadequate experience and self-knowledge, boys and girls of this age do know fairly well what they like and dislike. In spite of certain poses, boasting, and reticence, they will in general tell what they like and dislike. These likes and dislikes, these "drives" of desire and aversion, are far from transitory or evanescent.

Some of you in the state were so good as to send me judgments from memory of your liking for this list of occupations that I just read. I have about twenty-five such records submitted by the aid of superintendents of schools, all of whom I take this occasion to thank. It is clear from these records from doctors, lawyers, clergymen, business men, and teachers that there is much more permanence to these likings of vocation than we have commonly supposed.

Allowing for certain constant changes (everyone as he grows older cares more about managing people and less about mechanical work), it is the case that the resemblance between the occupational liking reported by the physicians and lawyers and business men at the age of twelve and at the present time is fairly close. The coefficient of resemblance or correlation is .6.

At any rate, transitory is not the right word to express these occupational likings. They are rather stable, permanent features of human organization. I can illustrate that by a similar inquiry in the case of young engineers, pupils engaged in the study of engineering. They reported as their primary interests studying with books and mechanical work as far back as they could remember. The difference between sixty school superintendents who were so kind as to do this for me and these sixty young engineers is perfectly clear and definite. It is also the case that these interests, these proclivities, are symptomatic of abilities. The gentlemen from Indiana reported not only the order of preference for these seven lines of occupational work but also the order of ability as they estimated it—which of them they thought they were best at, next best, and so on. I have from engineers and from a large group of clergymen and from a group of school superintendents and many others, records of a similar sort. We find everywhere the universal result that interest and ability within an individual are closely correlated. The resemblance here is about .9, one of the closest resemblances we find in human nature. In fact, to find something to illustrate the likeness between the order of a person's interests and the order of his abilities, I should have to say that they were about as alike as one of my hands is like the other or as one of my eyes is like the other. The resemblance between the right and the left hand is about .95 and the resemblance between interest and ability in the same person is about .90.

I have studied with certain groups that were cognizant of the matter, who understood the terms, the fundamental instincts of desire for approval, mastery, kindliness, gregariousness, interest in things and their mechanisms, interest in people and their passions, and interest in ideas and abstractions. I have studied these with respect to how far their relative strength in childhood is a prophecy of their relative strength in adult years. A child, for example, by whom the approval of the social group is more cherished than mastery of others is likely to become a man who seeks applause rather than power, and so on with the other instincts.

To help answer the question, In which main line of vocation will the pupil probably do best? we could find out how he does in a day's crude samples of each line; what qualities he possesses and in what degree which are needed in each line; and what some of his relevant interests are. All this we could do only imperfectly, but even so our selection for him would as a rule be better than his own or his parents' selection, or better, would be a useful aid to him and his parents. We do not know much of the demands made by the vocations; but they know far less. We judge the boy imperfectly; but his father's or his own self-judgment is beset by most of our errors and many others.

The other big question was, To what level of work within the vocation may he expect to attain? This question has a special importance because under present conditions in this country the high levels in certain varieties of vocation cannot be reached except thru special education. The professions, including the different branches of engineering, make requirements such that a boy or girl who aims that high has to train specially. In office work, selling, buying and selling, railroading or manufacturing, the higher levels are attainable by a person of the requisite ability from anywhere lower. In fact, it is rather the rule for the individual to work up thru the levels. But we do not make easy the passage from errand boy to drug clerk, to prescription compounder, to doctor's assistant, to doctor; or the passage from shoveller to foreman, to rodman, to assistant surveyor, to civil engineer. Moreover, there is a growing tendency to select for the higher levels in other vocations by outside education rather than by inside experience. Thus a farm manager is now often sought not from the abler farm hands, but from the agricultural college. Thus college men are selected for training as executives. Thus the officers of the army and navy were selected not only from successful soldiers, but from West Point and Annapolis. In the future we may expect more and more to see shop managers, office heads, employment managers, accountants, actuaries, and the like chosen largely from a limited group who have received higher education.

One meaning of this is that the higher levels in any variety of vocation tend more and more to demand intellect—the ability to think successfully about things and facts and people, ability to learn from experts and so keep pace with improved methods, ability to imagine and plan, ability to analyze complex situations into their elements and treat them by broad principles, ability to coördinate, to think things together, and to relate in one mind what would require a dozen minds to experience directly.

Now, fortunately, this symbolizing, analytic, abstracting, imaginative, selective, coördinating power is something which does show itself in youth and which can be tested. We can at least roughly measure it in any person at any time after he is fifteen or sixteen years old. Indeed, we can do so rather conveniently and cheaply. [Here the speaker read a part of a test which is not included herein.]

It would cost about thirty cents all told for material, for giving and scoring this test. For about a dollar we could give three such, making the content of one primarily about people and their motives, and the content of another primarily about things, mechanisms, and their modes of action, but emphasizing in all three the analytic selective and coördinating activities of the mind. We should find in general the feebleminded at the bottom of the scale of scores; the men who are day laborers or loafers of the most unskilled type next; the general run of factory hands, farm hands, domestic servants, shop girls, and the like next; skilled laborers, clerks, and salesmen, conductors, small-farm owners, small-shop owners, and the like next; and so on up to high-grade professional men, business experts, and the like at the top. We should find this in general only, of course. Individuals would be often far displaced; for energy, ambitions, moral stability, love of work, trustworthiness, and many special talents share with intellect the worldly success. We can, however, use the results to tell certain boys at sixteen that they will be unable to graduate from a reputable college; to tell others that they will be able to complete a medical school course only by extreme energy and devotion. We can, in a word, obtain a rough measure of intellect and obtain it very quietly and very cheaply.

I wish the same could be said of industry or perseverance, but you cannot test industry in thirty minutes. Anyone can be industrious for half an hour. I wish the same could be said of loyalty and devotion, but a laboratory classroom test is not appropriate to make and measure these. I wish the same could be said of what we call character—moral stability, solidity, and trustworthiness—but these demand the crucible of life for their testing. Here, where formal tests fail, is the opportunity for the school. By making the work of the school more like the work of life and by making the organization of the school more like the organization of life's enterprises, we may make a pupil's record in school more nearly a fair measure and prophecy of the industry, loyalty, and character which he will show in life itself. His school record then will be a potent means of help in the selection of his vocation.

In closing may I remind you that in this brief treatment details, difficulties, qualifications, complications, have been necessarily largely omitted or slighted? What we can learn about boys or girls, what the facts learned mean about their vocational possibilities under the confused action of the world's faces—these are topics which really require a lifetime of investigation, not an hour of talk!

Round Table: Application of Vocational Tests to Present School Problems

EDWARD L. THORNDIKE

THIS, as you know from the program, is announced as a round table discussion. This is your chance to bring up objections or criticisms or questions, or additional notes concerning this whole matter of vocational guidance, vocational education, vocational selection. I am at your service. It is barely possible that it may be desirable to shift a part of our time to examinations of the material for a test of clerical capacity, some of which I have here, and of some tests of mechanical ability, one of which Professor Whipple has, and of one sample set of tests which are used for the purposes of the army, which I have brought. If you will permit me, I will decide that at the proper time. If I feel we should save time for that I will say so. At the present, the meeting is open for each and every person here for some comment or question or discussion on vocational guidance and vocational tests.

MR. BLANK: When can you start to find out about the ability of a child?

PROFESSOR THORNDIKE: You can find out about a child's vocational aptitude at any point in the school course even from five to six years on, but you find out much more, of course, at or about the time when he is growing up, when he is thinking of adult things, feels that he is becoming a man, that is, from thirteen to say seventeen. Also it is rather fruitless for us to make vocational inquiries much before the time of the legal age limit.

PROFESSOR BOOK: Would it be possible to collect in a rather simple but systematic way certain information concerning each student when he is going thru the grades, which might be preserved, and so to bring together a pretty accurate and helpful basis for vocational direction at the legal age?

PROFESSOR THORNDIKE: I think we should all accept every word Professor Book has spoken except the one word—accurate. We can accept the word helpful but the less emphasis we make on the precision of the results the better. It is not wise to claim that we can chart out the career of a human being accurately at any time; there are too many disturbances to do it with precision. We can, however, do it better than he will do it without aid. Parents also are short-sighted, in spite of their intimate knowledge of children.

An instance brought to my attention was of a boy who was making at a very early age indeed well over $1,000 a year by a syndicate for the sale of the *Saturday Evening Post.* I think he had some forty boys who owed him a percentage on a certain arrangement for organizing the business and directing their work. He had absolutely no interest in any physical or biological subjects, yet they were insisting that he prepare for entrance to a medical school and driving him into a medical career.

Another case, which would probably come in the experience of every one of us probably, is of a boy or girl whose only notion of getting work is walking up and down the streets and seeing a sign, "Boy wanted." All the vocational guidance he gets is from the window sign.

A record of interest in studies of social adaptation and of school enterprises, such a record as Professor Book has spoken of—would be very useful, and every step we take toward widening the sphere of the school, every time we add a shop or a kitchen, or a school garden and the like, will improve the value of the record, because then we get information over a wider field.

MISS RACE: Would a study of the parent's occupation and the occupations of the other ancestors, uncles and aunts say, of a child help?

PROFESSOR THORNDIKE: It would help in any case; in a stable condition of civilization it would help a great deal. So many of our parents represent the foreign-born, who have been displaced out of their natural vocation by the matter of immigration that in this country the facts are peculiarly difficult. The Russian Jew, for example, who is by nature a scholarly man may make his career in this country by first being a pack peddler and then a business man, because there is not very much demand for students of the Talmud in this country, and there is a large demand for shrewd business talent.

An examination of the parents—talking with them, writing down impressions of their intelligence, of their interests, character, lines of strength and of defect—would certainly help in connection with the children.

MR. FELT: How much time are you going to give these children on these things? If you put him in the agriculture department for a while, in the shop for a while, in the printing shop for a while, isn't there a possibility of his becoming a sort of a Jack-of-all-trades?

PROFESSOR THORNDIKE: That is, of course, a danger. It is a question, however, whether it is better for a nation to have its people do their rambling after they are full-grown or do it when they are young and their time is worth much less. I think that we can define these elections somewhat sagaciously for children, so that certain utterly aimless rambles will be forbidden and so that a choice of certain work will require the pupil to continue at it for a stated time. Thus we may rule that a child, having chosen a course in the shop, must complete it or lose certain privileges. A rich school program with semi-vocational studies is hard to administer, and I must confess that some of the proposals for vocational projects in the school seem to me impossible for a teacher of thirty children to carry out without just the scattering that Mr. Felt fears.

PROFESSOR BOOK: I realize the extreme complexity and difficulty in the matter of giving and helping young people in making actual selections in this state if you begin to try to give a good deal of vocational information. At the present time college students and persons in high school leave school and go into various kinds of work, make selections not on the basis of facts, not on what education offers, etc. One thing we could properly work on would be to give this vocational information about the more important occupations and professions, and do that by means of moving pictures and things of that sort and the other. This try-out work was mentioned to make the manual training work a little more purposeful, and to have the more important try-out work in a few more definite lines which would add to some of the specific points you mentioned yesterday and might be put on the school record. I think it might be helpful for some of you to state what you have been doing along these lines and as one question ask Professor Thorndike to give us a bill of particulars of a few definite things we could work at coöperatively which will give us some definite help by getting information that would be valuable in our counsels with the young people and with parents. I feel personally that the biggest step that has been taken in education is to make it a little more directive and specifically helpful to the individual by way of preparing him to do some of that kind of work.

That is the end and the goal, and if we can get a few definite things that we can work at and work at coöperatively, I think that would be a great thing to do. And one of the main things I would like to have this conference contemplate is to try and pick out the things that we could work at coöperatively, and to begin now.

PROFESSOR THORNDIKE: Professor Book, you are much better qualified to answer the questions you ask than I am. I will make a suggestion. I haven't much confidence in it. It is a little more along the line of investigation than it is along the line of action perhaps and action is primarily what is demanded. It seems to me that if the schools of Indiana could coöperate in going back over the records of a thousand boys and girls who have succeeded in clerical work, and another thousand who have failed in this work; a thousand who had succeeded in learning a skilled trade, and another thousand who entered that trade and failed for lack of ability; one thousand who succeeded in selling, and another thousand who have tried that and have relatively failed, they would do a great service. If a child does well in arithmetic does that mean anything about his being of the selling or mechanical or office-work type? Is a boy who is troublesome in conduct in school unreliable and troublesome in the shop? There are hundreds of such questions, which such an inventory would help to answer. If we could get from Indiana boys and girls who graduated from the seventh grade or above, a direct inventory of their industrial experiences, and relate the facts to their school records, I know it would be helpful.

MR. HIMELICK: It seems to me there are just three things that we are concerned about in this problem. One of them is the determination of what the child can do; the second is to help him to get prepared to do that thing; the third is to find him a job. Now, it seems to me from the administrative side—I am not so sure from the educational side—as we think of it in the schools and cities, it is comparatively an easy matter to find out what he can do properly in a general way, it is fairly easy to help him get prepared to do that thing. It seems to me the biggest educational problem that really confronts us today is to know how we are going to get this individual outside of a few professions. In Fort Wayne we only have a limited number of positions that can be occupied by these individuals as these children go out. What are we going to do? It seems to me that is one of the problems.

Of course, if we had the education, we could fit the individual for a specific thing regardless of what he wanted to do, and then manage him. What are we going to do from the administrative point after we find out what they can do? How much further can we go to finding them jobs?

PROFESSOR THORNDIKE: Is there anyone experienced in coöperation with employers in school placement bureaus and the like? His experience would be helpful to report here in response to Mr. Himelick's point.

MR. HIMELICK: May I make it a little more specific? In Fort Wayne in a little survey of a general type we found, for instance, that in the knitting mills in Fort Wayne they need so many people, in General Electric so many people in certain lines, and in the Bowers plant a certain number, and in certain other places a certain number. Now those figures in no way at all correspond to the type of things the children want to do.

PROFESSOR THORNDIKE: About that I can say something. It is a general passion for human nature to want to do things which are entirely different from those that the world wants us to do. It is an inevitable conflict as old as the world. I, for example, want to do research work. I get a salary for teaching certain specified classes. The school principal wants to be an educational reformer and keep ahead of John Dewey, but the city requires him to hold down his ward and keep things quiet and comfortable! A boy wants to go into automobile racing if he can't get into aeroplane racing. The world makes a small demand for either of these things. A girl wants a nice quiet office position where she won't soil her clothes or hear vulgar language or be out of her class, which won't prevent her from prospects of marriage. We have to control that passion and I think that one big lesson we can teach is by assuming that in any case the child is ready to begin at the bottom. Their choices are, "Do you want to work on land or soil or in office? Do you want to work influencing men in business? Do you want to work, working with things in machines and trains? In any case you have to begin at the bottom and do what you are told. The training we give you is to represent the training for your career for forty years. It is not to place you at the beginning in any particular position. It is to fit you in a very broad way for a broad life. We may give you work that will fit you for a sales-manager later on, but what you are going to do now is to sweep out the office. We will give you training that we hope will make you do well with office management or the like, but at the beginning you will copy form letters day after day."

The school might as well first as last remove this notion that in training for an industrial career it makes very much difference what the detailed kind of work is. It makes a great deal of difference if one who longs for the soil is misplaced in the office, or if a person who longs to be influencing people is misplaced in a factory working with machines. I would not assume responsibility for filling particular positions or for providing children with the particular kind of work that they fancy.

MR. GILES: Isn't it possible for our school to take care of this tendency to shift around so much? I visited the Milwaukee school, the part-time school there. They told me that the boys on the average there change from one line to another from three to four times before settling down. In the Junior high school at Richmond our plan is to take care of that somewhat. We have the four trunk lines of trade work there—the metal shop, a wood shop, a printing shop, and the electricity—and the clerical line and the academic line. We make them all try these out with the idea of preventing so much of this shifting later on. It is not a vocational course; it is just a field for trial there to prevent this shifting a little later on.

MR. RAY: It seems to me that what we could do below the high school in a general way is rather important. I have in mind this thing. I believe that when young people come to the time of selection of their vocation they don't know what to do because they don't understand society, they don't understand what we call social progress. We see that on the part of the men in the army. They don't know with what department they want to enlist. We also see that with a group of college girls here. I found out that those college girls don't know what they ought to go out and do after they get out of college. They asked me a number of questions that in my mind were significant.

The practical suggestion I had in mind was this: It seems to me that the best thing we can do in the elementary schools is to begin early to make out a curriculum—a social curriculum, to make material that goes into the material of life, tested strong with reference to whether it is really a mark of that thing out there we call life. As I understand it, arithmetic or geography or English or spelling or domestic science, or whatever you may call any particular subject is just a convenient label as applied to certain aspects of life. And if we get that point of view permeating our selection of material and fill the curriculum full of that material—such splendid material as we are getting from the national department—the children will have an intelligent background, a foundation with which to make a better selection. It seems to me that this is the most practical problem for us and the most important thing we can do. I realize the social importance of this problem for vocational selection. It is something we should not trifle with unless we are sure of where we are, unless the pupil—the girl or boy himself—knows something about the things he is going into.

PROFESSOR THORNDIKE: In following out Mr. Ray's suggestion, we need also to be particularly careful not to confuse reading and hearing about life with life itself. For example, I like to read about farms, but farming—far from it. Many of us are fascinated with reading about life in the factory—how these shoes pass eighty-four people, each person doing some little thing—about the factory organization, the division of labor, etc., but that isn't getting any knowledge of factory life that will help us in telling whether we will like to be a factory hand or factory foreman. I don't believe we will make a very much closer connection by studying *about* factories than we make by study about the planets or rotundity of the earth. It is the actual *participation* that reveals to a person his ability and interests. Now, the administration of a school which actually participates in productive labor, in the farm, factory, or office represents a type of administration and skill and expense of money which this country and no other country has ever seen.

It is a question whether you can have bona fide participation without a money wage, without the actual condition of work for a money wage.

The problem of vocational information by participation in industrial and social life is enormously important but we mustn't forget that it is enormously difficult and that we are not handling it by simply giving lectures or circulating books about such work.

Recent Developments in Educational Measurements

EDWARD L. THORNDIKE

I HAVE two divisions of the talk planned, but I will reduce the first to practically three minutes. If time should remain at the end, we can take that up by a discussion from the floor.

I do wish to refer those of you who do not know about it to the Hahn scale for measuring achievement in geography, samples of which you can examine. From these you see the general plan. It is a graded series of questions, quite conventional questions taken from textbooks, from examination papers, and from regular school practice, but carefully graded in difficulty on the basis of replies, 283,000 in all, from seventeen hundred students. The questions range in difficulty from "What is the capital of your state?" "What direction are you facing when your back is toward the north?" or "Name two things plants must have to live," up to "Name three exceptions to the general rule that the farther from the equator one goes, the lower the temperature is," or "If the earth's axis were inclined 15 degrees instead of 23½ degrees, how wide would the north temperate zone be?" This scale is obtainable from Professor H. H. Hahn, State Normal School, Wayne, Neb., for seven cents.

In the second place, I wish to call your attention to the scale for measuring knowledge and thought power in the case of United States history, which will shortly be published, being the work of Mr. M. J. Van Wagenen, which represents an attempt to make more scientific and more convenient and more commensurate our knowledge of the information and historical judgment possessed by pupils. I will read one sample from the thought questions:

"Mr. McLean, who had been Postmaster-General under President Adams, had been an ardent supporter of General Jackson for President. Jackson, when he became President, felt that in adopting the policy of rewarding his friends and punishing his enemies, Mr. McLean was entitled to a position. As Postmaster-General, Mr. McLean, however, had always refused to make appointments and removals upon the ground of party connections, and had strongly condemned such a practice. President Jackson sent for Mr. McLean, to whom he stated that he should adopt the policy of removing from office such persons as had, during the canvass for President, taken an active part in politics, and asked Mr. McLean whether he had any objection to this line of action.

To this Mr. McLean replied that he had not. "But," said he, "if this rule should be adopted it will operate as well against your friends as those of Mr. Adams, as it must be impartially executed."

After walking up and down the room several times, President Jackson said, "Mr. McLean, will you accept a seat upon the bench of the Supreme Court?" McLean was later nominated for the Supreme Court.

The question is, "Draw a line under three of the following words that describe McLean as he appears in the incident: *cowardly, servile, obstinate, firm, stubborn, honorable, submissive, conscientious, irresolute.* Draw a line under the three of the following words which you think best describe President Jackson: *shrewd, unjust, suspicious, credulous, clever, servile, sagacious, false, deceitful, treacherous.*" The Van Wagenen scale represents a new and important line of work in tests.

In the third place, I wish to call your attention to certain experimental work on special difficulties and disabilities. I haven't time to describe this at all but a new line in measurement work in education is represented by the publication which I hold in my hand, *The Psychology of Special Disability in Spelling*, by Dr. L. S. Hollingworth, assisted by C. A. Winford.

Everything I have to say will have more interest for you this afternoon if you will jot, upon one of the sheets of paper you have, your answers to the following questions. These need not be signed. I shall not collect them unless you wish to give them to me. I ask you to do it because it will keep the questions in mind better than if I simply recite them; I also think it will bring out certain points that might otherwise escape us. Just take these in order and save a line for each. First, I will read ten words in order, asking you to make your estimate of times the word appears in the first five books of an average series of readers. The first word is *ache*—put down your estimate; the second word is *beginning*, the third is *break*, the fourth is *business*, the fifth word is *built*, the sixth is *choose*, the seventh is *cough*, the eighth word is *doctor*, the ninth word is *easy*, and the tenth word is *February*.

Now consider these questions. Take the average textbook in arithmetic designed to cover the work up thru grade six and estimate how many times you will find the case of 2 plus 8, or 12 plus 8, or 22 plus 8, etc., where the essential combination is 2 plus 8. Then do the same with 2, 12, 22, etc., plus 9. How many times will we find the 2 plus 9 combination? Then estimate for the 9 plus 8, 19 plus 8, 29 plus 8 set; and fourthly for the 9 plus 9, 19 plus 9, 29 plus 9 set.

Next consider how often you will subtract 2 from 3 if you do all the work outlined in the book up thru grade six. Then estimate in the same way for 2 from 11; then for 9 from 10; and then for 9 from 11

Estimate in the same way the number of occurrences of 9 times 7, 7 times 9, 63 divided by 9, 64 divided by 9, 65 divided by 9, 66 divided by 9, 67 divided by 9.

Now answer this question, In the average second reader, how many words are there which appear only once, twice, or three times (in the whole second reader)?

The next question is, If you should take ten of our most popular series of third readers, how many different words would there be in the entire ten?

Last of all, How many words would you find in all the ten third readers or in practically all of them?

The rest of our time I am going to spend on a variety of measurement which is as yet unreported anywhere in print. What we measure is not the achievement of school pupils, but the instruments of instruction.

There has just been beginning in the last five years certain work applying the same statistical care and somewhat of the same industry to the problem of getting accurate knowledge of the instruments which we use in teaching as have been spent on the problem of measuring pupils' achievements.

From your experience in trying to answer these questions, you probably will be willing to admit that no matter how expert a group of school men and women you take, they certainly do not know facts about the instruments of instruction. You feel very little confidence in the exactness of the answers you have given to these questions.

The general text, indeed, of what I have to say will be this: Neither you, nor I, nor anyone I know of, really knows the instruments that we work with. We are like physicians who pour drugs out of a bottle, not knowing what is in it. We have a pupil who has been thru five readers of a reading series. We do not know what words he has seen, how often he has seen them, or his experiences in connection with them.

A pupil who has had a standard course in arithmetic thru grade six and has done all the work in the book is estimated by a group like this to have added 8 to 9 from 208 times to 4,300,000 times! *Ache* is estimated to occur all the way from 1 to 1,000 times in the five readers of a standard series; *cough,* 1 to 100; *doctor,* from 1 to 500; *house,* from 1 to 250. *Shoes* was put all the way from 2 to 750, *sugar* all the way from 3 to 750.

Before we continue with our estimates, let me bring certain points up to show that these are important, not merely as evidence of our relative ignorance of these instruments, but for some vital issues. About six years ago, I began counting up the words in the first fifty pages of beginners' books in arithmetic, using ten popular and widely used texts. I found this list of words appearing in books supposed to be used by children of grade two or three: *absentees, account, admitted, angles, agreed, Albany, alternate, arrived, assembly, automobile, baking-powder, balance, barley, beggar, Boston, camphor, California, Chicago, cinnamon, clothes-pin, comma, committee,* etc., on thru *hesitation,* and *horsemen* to *preserving* and *property* and *transaction.* Now, I submit that no teacher who found words of that sort in the first fifty pages of an arithmetic textbook would consider that a proper burden upon the children. Obviously, there is no advantage in having this galaxy of proper names, *Adele, Agnes, Byron, Charlotte,* etc., up to fifty-four proper names, to burden the children in reading when they are having difficulty enough with the arithmetic itself. Neither the teacher, nor the supervisor, nor the author would tolerate the use of these unnecessary words if they were aware of it. We simply have not noticed it. Any instrument of instruction should be simplified with respect to vocabulary.

I am now going to quote from a similar study made, I think, last year, I don't know just when, by two gentlemen whose names I am glad to report here. The study was made in Iowa by Earl T. Housh and William S. Miller. The study by Housh concerns the vocabulary of ten second readers. The study by Miller concerns the vocabulary of ten third readers. They counted every word that occurred in every reader and every appearance of every word.

How many words in a second reader, I asked you, appear only once, twice, or three times? There are about 1,000. It is hard to believe that, but the average of ten supposedly tip-top second readers has 1,000 of those words; about 550 that he sees once, about 300 that he sees twice, and the remaining number he sees three times. That is to my mind one of the most extraordinary facts that have ever been found in educational work—extraordinary because no one ever noticed it before, because our ordinary observation, no matter how sagacious and expert, has missed it. Evidently we require, for knowledge of the instruments of instruction, the same careful measuring and counting and full analysis which we have learned to apply to the examination of children's achievements.

I recommend that this conference, instead of publishing any of the things that I have said at these meetings, write to Messrs. Housh and Miller and print their reports as the contribution from this conference in measurement. It would be a public service to education to have them printed.

[The speaker here commented on the following table, from Mr. Miller's study:]

TABLE I.—THIRD READER VOCABULARIES

NAME OF READER	NUMBER PAGES READING MATERIAL	TOTAL NUMBER OF WORDS	NUMBER OF DIFFERENT WORDS	AVERAGE REPETITION
A................	286	34196	3625	10.6+
B................	266	29139	3311	11.3+
C................	164	19958	2717	13.6+
D................	236	32654	3203	9.8+
E................	154	27631	2157	7.8+
F................	192	21161	2417	11.4+
G................	202	21538	2527	11.6+
H................	240	28727	3201	11.1+
I................	270	41399	3410	8.2+
J................	214	26934	2810	10.4+

TABLE II.—THIRD READER VOCABULARY: RARELY USED WORDS

TIMES OF WORD REPETITION	NAME OF READER									
	B	C	A	E	I	H	F	D	J	G
Number used once....	1360	971	1613	824	1435	941	967	1385	1124	1024
Number used twice...	551	447	512	314	542	485	458	449	527	472
Number used three times..............	230	232	254	155	268	305	249	250	222	225
Total............	2141	1650	2379	1393	2245	1731	1674	2084	1873	1721
PER CENT OF WORD REPETITION										
Per cent used once....	41.1+	32.0+	46.1+	37.7+	42.0	29.3+	40.0+	43.2+	40.0+	40.5+
Per cent used twice...	16.0+	12.7+	14.6+	14.5+	15.8	15.1+	18.9+	14.0+	18.7+	18.6+
Per cent used three times..............	6.9+	8.5+	7.2+	7.2+	7.8	9.5+	10.0+	7.8+	7.8+	8.8+
Total............	64.0	53.2	67.9	59.4	65.6	54.9	68.9	65.0	66.5	67.9

There are 655 words that are common to all the ten third readers, out of a vocabulary of over 9,000 words. Surely out of 9,000, 4,000 are better than the other 5,000. Certainly the 655 which are common to all must have some superiority over the 5,000 or 6,000 that appear only a few times in the entire ten books.

It is a little thing to count up words in the book. Some of you may say, "That is statistical pedantry." But it seems to me that when we find in ten standard readers with a vocabulary of 9,000 words, only 655 words that are absolutely needed, that statistical pedantry is very desirable.

I haven't time to read the vocabulary which Mr. Miller gives of the 655 words. There we have a list which seems to me deserving of very great attention. The most common one is *the*, which occurred in the ten books, 21,000 times, and so on down the list. These 655 words would be a perfectly proper list to use in making up tests and should be of very great assistance.

Let us now turn for a moment to the famous "100 spelling demons". We have a list made up of 100 words which are commonly used in correspondence and the like, and very•commonly misspelled, from which fact the name "100 spelling demons" has been attached to it.

It occurred to me to look up the experience that a child would have with these words in the course of his reading, in the regular series of reader, supplementary reading, arithmetic, and what-not, and see whether his failure with the spelling demons should be accounted for by lack of experience with the words, or by lack of proper perception of them. The list runs as follows: *ache, again, always, among, any, answer, been, beginning, believe, blue, break, business, built, busy, buy, can't, choose, color, coming, cough, could, country, dear, does, don't, done, doctor, early, easy, enough, every, February, forty, friend,* etc. My first thought was that if children go wrong on those words, they must see the words so often that their failure to spell them must be due not to lack of experience, but to improper experience, inadequate perception, failure to really see them in detail.

I have traced these words thru two series of readers. They agree very closely and the average of the two may fairly well represent any series of readers. The word *ache* occurs once, the word *beginning* twice, the word *believe* 7 times, the word *break* 9 times, *business* 11 times, *built* 11 times, *cough* 0 times, *doctor* 7 times, *easy* 7 times, *February,* a half time.

Let me carry that a little further. Suppose a child is writing letters home. He dates his letter Wednesday, February 4th. How often will he have seen *Wednesday?* He would have seen *Wednesday,* never! How often *February?* He would have seen *February* a half a time! Suppose he goes on to say, "This week I am having a cough and am hoarse," something any child might write. How many times would he have seen *week?* Four and a half times. How often *having?* Five and a half times! *Cough?* Not at all! *Hoarse?* One and a half times! These are all household words. He goes on and says, "The doctor asks if my head aches." How often would he have seen *doctor?* Seven times. *Ache?* Twice. "Are you making me a loose blouse to wear?" How often would he have seen *making?* Six times. *Loose?* Five times! *Wear?* Nine times. "It is easy." How often would he have seen *easy?* Six and a half times. He signs himself, "Yours truly." How often would he have seen *truly?* Seven times. That is about once a year. You can't expect a child to spell a word correctly when he sees it only once a year. It is obvious that if the child learns to spell it, he learns by some special drill and use in writing. He won't learn these words from seeing them in the reading, because they don't occur there. Words like *giants* and *fairies* occur much more than *Wednesday, doctor, headache,* etc. The common household vocabulary of writing doesn't appear largely in our readers.

We have two classes of failures to spell these spelling demons. In one class the child's difficulty is due to the fact that he has not seen the words. In the other class the child's difficulty is due to the fact that he has not seen them correctly. A word like *they* and *said* he sees 750 times as often as some of the others. There are two radically different sorts of causation of the trouble.

I am going to take a few of the words and carry them thru four or five studies for you. The word *ache* occurs in books I to V 1 1-3 times; 2 times in books VI and VII; it didn't occur at all in the ten second readers of Housh's study; it occurred twice in the ten third readers; in arithmetic it doesn't appear. The word *ache,* that is common to fathers, mothers, and children, in households, is not a "reading" word. If you wish to learn to spell it, you have to make that a definite, special task.

Take the word *easy.* You will find that 6 times in one series up thru the fifth reader, 7 times in another, 4 times in the sixth and seventh readers of one series, not at all in one series of arithmetic, once in another series, 2½ times in the average second reader, 24 times in all ten, once in the average second reader, 3½ times in the average third reader.

The word *lose* you will find 4 times on the average in the two series up to book V, 4 times in books VI and VII, 16 times in the first two books of a three-book series of arithmetic, once in the average second reader, twice in the average third reader.

I have taken your time with those statistics simply to illustrate two points. The first is that if you have to teach the spelling of a word you ought to know the teaching history of that word—what experience a child has had of it. The second is that there is a distinct, sharp difference between the vocabulary of writing and the vocabulary of reading.

It is a question of some consequence to know how much habituation is required to inculcate certain fundamental facts in arithmetic. We cannot, without having somebody follow the child thru school and keep track of all the oral drills, making discounts for times he is inattentive and the like, get measures of children's actual experiences. We can, however, as I have done, count up the number of experiences the child would have if he did honestly all the work outlined in some standard educational instrument.

I will first give you the facts in the case of one series. This doesn't represent an average and these numbers should be taken circumspectly. One of your estimates was for 2, 12, 22, etc., plus 8. We get estimates in answer to that running from 200 up to over 3,000,000 from persons like ourselves. The fact in this series was 140. The fact in the case of 2, 12, 22, etc., plus 9 was 104; the fact in the case of 9, 19, and 29 plus 8 was 99; for 9, 19, and 29 plus 9, it was 86. In general, there is a notable tendency to overestimate the amount of drill in addition that a child receives from going thru the work of a standard instrument. We expect he will get much more than he does.

Consider now the case of subtraction. How often do we have 2 from 3; 9 from 10; and 9 from 11? Two from 3 in this series occurs 149 times, 9 from 10 occurs 91 times; and 9 from 11 occurs 35 times. As the pupil has the subtraction combination, 9 from 11, 35 times, he has it about once a month, if he does all the work there is in the book. In general, you see the overuse of the smaller numbers and the underuse relatively of the larger number.

Nine times 7 occurs 110 times. Seven times 9 occurs 118 times; 63 divided by 9 doesn't occur at all; 65 divided by 9 occurs once; 66 divided by 9, four times; and 67 divided by 9, once.

Let us now turn to another line of investigation, somewhat more subtle, but perhaps equally worth your attention. This concerns a problem of the distribution of practice in an instrument of instruction, such as a course of study or a textbook, or the like. We have, let us say, 400 examples in multiplication with a two-place multiplier given in the book. How should they be distributed? Of these, 395 given in one month and the other 5 the next, and none after that would be bad distribution. We might have them distributed this way: the first month 2 of them, the next month 4, the next month 8, and the next month 16, etc., which is a very bad distribution.

I am going to plot very, very roughly some of the distributions. I will use the case of multiplication with three-figure multipliers with zero as the second figure. Each figure that I read will represent about two weeks' work. It represents, in fact, eight consecutive pages in the textbook. Beginning with the first place where multiplication with a two-place multiplier is taken up, it runs 0, 0, 0, 0, 0, 0, 19; that is, the first treatment is 19 examples coming within the eight pages. Then 0, 0, 0, 0, 6, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 2, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 2, 0, 0, 0, 0, 0, 0, 0, 2, 1, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0. The total amount of practice with this sort of multiplication is 33 problems, 19 of the 33 at the very first appearance, and the rest scattered on thru the work from the third thru the sixth grade. The work of grades 7 and 8 is not taken account of in this chart. That is, we have substantially a first treatment of 19, during about a seven-weeks' interval; a second treatment of 6, and then scattered problems every now and then to hold the procedure in mind. [The speaker here illustrated other forms of distribution of practice.]

To close, I am going to take one study with a different point of view. Some of you may not be much interested in the amount of practice and way in which the practice is distributed, but you are all interested in making the instruments of instruction humane and relevant to the interests and daily life of the children.

In even so little a thing as the words used by a textbook or other instrument of instruction, we can get information about this. The words used by textbooks give some indication of how far the aim of adaptation to healthy childish interests in other children, home affairs, and the activities of things, animals, and plants, is met. Consider, for example, the words *home, mother, father, brother, sister,* representing the home life and human relationships which little children care so much about. Consider *plate, knife, fork, spoon, play, game, toy, tag, marbles, doll, run, jump, sing*—words concerned with the acts and the games of children. Consider *plant, seed, grow, flower, carwheel, string, cut, dig.* These words represent in a way things germane to childish, healthy, natural interests.

I have counted up the frequency of the appearance of those words in the first fifty pages of eight of the beginners' arithmetics, of which I spoke earlier. I have listed the number of times the word in question appears. If it appears more than ten times I left it at ten for convenience. The words *fork, knife, spoon, jump, sing,* and *tag* did not appear at all. *Toy* and *grow* appeared each once in the four hundred pages. *Play, run, dig, plant,* and *seed* appeared about four times, about once per hundred pages. *Baby* did not appear as often as *buggy! Father* appears about one-third as often as *farmer!* Book A shows only 10 of those 30 words; Book B shows only 4 of those 30 words; Book C, only 12; Books D, E, F, G, 13, 8, 14, 23 respectively. It seems, then, that we have here evidence of some neglect of childish interests.

In general, the neglect of childish interests does not seem to be due to provision for some other end, but to the same inertia of tradition which has carried over the problems of laying walls and digging wells into city schools, whose children never saw a stone wall laid or a well dug.

For example, I have made up a list of words running thru a larger part than the first fifty pages. On the one hand, we have this series, *earn, eat, gather, learn, lead, lift, lunch, march* and *men.* On the other hand, we have occurring just as often in these books a list beginning with *Ecuador* and ending with *miscellaneous.* I submit to you whether a list beginning with *Ecuador* and ending with *miscellaneous* is as good a list as one beginning with *earn* and ending with *lunch, march,* and *men.*

I hope I have convinced you that we can apply scientific methods to measuring the instruments of instruction with the same hope of benefit that we have received from its application to measurements of school achievements.

Plans for Saving Time in Grades VII-XII Inclusive

Henry Lester Smith, Dean of the School of Education, Indiana University

This report on plans for saving time in grades 7, 8, 9, 10, 11, and 12 is based upon the replies to a questionnaire that was sent out originally in July, 1917. Some duplicates were sent out in the following September to certain cities that had failed to reply to the first request. The questionnaire sought information concerning the use of sixteen separate plans for shortening the period from the seventh to the twelfth grades inclusively. The sixteen plans were as follows:

1. Irregular promotions, i.e. promotions within a term, or double promotion at the end of a term.
2. Ungraded classes for specially bright children.
3. Tutoring as a preparation for skipping a grade.
4. Permission to do extra outside work for credit before or after school.
5. Permission to carry extra subjects during school hours.
6. Permission to supplement the regular day school with work taken in the evening schools.
7. Summer school work.
8. Credit for outside home work, such as music, Bible study, home projects.
9. Segregation of graded bright children for specially rapid progress.
10. Introduction of high school subjects into the grades.
11. Elimination of the eighth grade.
12. Credit for quality of work done—extra credit for extra quality of work.
13. Elimination of certain subjects.
14. Promotion by subjects.
15. Increasing the length of the school day.
16. Increasing the length of the school term.

In connection with each of these plans information was requested concerning whether the plan was in operation, the length of time the plan had been in operation, the grades in which it had been in operation, the number of pupils in each grade, and the approximate percentage of pupils in each of these grades receiving some extra credit as a result of the plan.

NUMBER OF REPLIES RECEIVED AND THEIR DISTRIBUTION

A total of 1,363 questionnaires was sent out to the larger cities in each state of the Union. Of these, 409 cities, or 30 per cent of the whole number receiving the questionnaires, sent in replies. The data were tabulated on two bases: (1) that of the section of the country from which they came; (2) that of the size of the school unit from which they came. For the purposes of this report the information as a whole was divided into four sections: the southern section, including the states of Alabama, Arkansas, Florida, Georgia, Louisiana, Oklahoma, Mississippi, North Carolina, South Carolina, Tennessee, Texas, Virginia, West Virginia, Kansas; the western section, including Arizona, California, Colorado, Idaho, Montana, New Mexico, Oregon, Utah, Nevada, Washington, Wyoming; the central west, including Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, North Dakota, Ohio, South Dakota, Nebraska, Wisconsin; the northeastern section, including Connecticut, Delaware, District of Columbia, Maine, Maryland, Massachusetts, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, New Hampshire.

On the basis of total school enrollment in the school unit, schools reporting were divided into seven groups:

Group I. Those enrolling from 100 to 500 pupils inclusive.
Group II. Those enrolling from 501 to 1,000 pupils inclusive.
Group III. Those enrolling from 1,001 to 1,500 pupils inclusive.
Group IV. Those enrolling from 1,501 to 2,000 pupils inclusive.
Group V. Those enrolling from 2,001 to 4,000 pupils inclusive.
Group VI. Those enrolling from 4,001 to 10,000 pupils inclusive.
Group VII. Those enrolling from 10,001 to 100,000 pupils inclusive.

According to the section of the country from which replies came, the replies were distributed as follows: from the southern states, 88 replies, or 26 per cent of the total number of questionnaires sent to cities in the southern states; from the western states, 55 replies, or 21 per cent of the total sent to cities in the western states; from the central states, 153 replies, or 36 per cent of the total sent to cities in the central states; from the northeastern states, 113 replies, or 35 per cent of the total sent to cities in the northeastern states.

The cities of the central states sent in the largest percentage of replies, the cities of the northeastern states the next largest, the cities of the southern states the next, and the cities of the western states the smallest percentage.

On the basis of total enrollment in the schools the number of replies, with the per cents they were of the total number of replies received, distribute themselves as follows:

Group I (100 to 500 enrollment): 31 replies or 7.5 of the total.
Group II (501 to 1,000 enrollment): 58 replies, or 13.7 of the total.
Group III (1,001 to 1,500 enrollment): 80 replies, or 19.5 of the total.
Group IV (1,501 to 2,000 enrollment): 63 replies, or 15.4 of the total.
Group V (2,001 to 4,000 enrollment): 99 replies, or 24.7 of the total.
Group VI (4,001 to 10,000 enrollment): 47 replies, or 11.6 of the total.
Group VII (10,001 to 100,000 enrollment): 31 replies, or 7.5 of the total.

Cities of Group V (2,001 to 4,000) furnish the largest percentage of replies, followed by the other groups in the following order: Group III (1,001 to 1,500); Group IV (1,501 to 2,000); Group II (500 to 1,000); Group VI (4,001 to 10,000); VII (10,001 to 100,000); Group I (100 to 500). The largest percentage of replies, therefore, was received from the central section of states, whereas the smallest percentage of replies was received from the western section of states. Of the total number of replies received the largest percentage was received from cities of Group V (2,001 to 4,000) and the smallest percentage from Groups I (100 to 500) and VII (10,001 to 100,000).

If each of the 409 replies had been in the affirmative, there would have been 6,544 affirmative replies to the 16 questions combined. There were actually 1,913 affirmative replies. In other words, affirmative replies received represented 29.2 per cent of the affirmative replies that would have been possible in case each city responding had replied affirmatively to each of the 16 questions. These 1,913 affirmative replies distributed themselves as follows, the percentages being based on the total of 409 cities:

270, or 66 per cent to question 7 (summer school work).
265, or 64.8 per cent to question 5 (permission to carry extra subjects during school hours).
262, or 64.1 per cent to question 1 (irregular promotions, i.e. within a term, or double promotion at end of term).
200, or 48.9 per cent to question 14 (promotion by subjects).
141, or 34.5 per cent to question 8 (credit for outside work, such as music, Bible study, etc.).
134, or 32.8 per cent to question 3 (tutoring as preparation for skipping grade).
134, or 32.8 per cent to question 4 (permission to do extra work before or after school).
130, or 31.8 per cent to question 10 (introduction of high school subjects into the grades).
89, or 21.8 per cent to question 9 (segregation of graded bright children for specially rapid progress).
67, or 16.4 per cent to question 6 (permission to supplement the regular day school with work taken in the evening school).
57, or 13.9 per cent to question 2 (ungraded classes for specially bright children).
42, or 10.3 per cent to question 11 (elimination of the eighth grade).
40, or 9.8 per cent to question 15 (increasing the length of the school day).
34, or 8.3 per cent to question 13 (elimination of certain subjects).
31, or 7.6 per cent to question 12 (credit for quality of work done, e.g. extra credit for extra quality of work).
17, or 4.2 per cent to question 16 (increasing length of school term).

The number and per cent of the affirmative replies to the various questions from the southern section are as follows:

Question 7 (summer school work) 70 affirmative replies, or 79.5 per cent.
Question 1 (irregular promotions), 54 affirmative replies, or 61.4 per cent.
Question 5 (extra subjects during school hours) 52 affirmative replies, or 59.1 per cent.
Question 14 (promotion by subjects) 45 replies, or 51.8 per cent.
Question 11 (elimination of the eighth grade) 32 replies, or 36.1 per cent.
Question 3 (tutoring as preparation for skipping a grade) 28 replies, or 31.8 per cent.
Question 8 (credit for outside work) 24 replies, or 27.3 per cent.
Question 10 (introduction of high school subjects into grades) 23 replies, or 26.1 per cent.
Question 4 (permission to do extra work before or after school) 23 replies, or 26.1 per cent.
Question 9 (segregation of graded bright children for specially rapid progress) 12 replies, or 13.6 per cent.
Question 12 (extra credit for extra quality of work done) 11 replies, or 12.5 per cent.
Question 6 (supplementing regular day school with work taken in evening schools) 10 replies, or 11.4 per cent.
Question 2 (ungraded classes for specially bright children) 9 replies, or 10.2 per cent.
Question 13 (elimination of certain subjects) 7 replies, or 8 per cent.
Question 15 (increasing length of school day) 7 replies, or 8 per cent.
Question 16 (increasing length of school year) 2 replies, or 2.3 per cent.

The number and per cent of the affirmative replies to the various questions from the western section are as follows, the percentages based on the total of 55 cities:

Question 7 (summer school) 41 replies, or 74.5 per cent.
Question 1 (irregular promotions) 40 replies, or 72.7 per cent.
Question 5 (carrying extra subjects during school hours) 38 replies, or 69 per cent.
Question 8 (credit for outside work) 35 replies, or 63.6 per cent.
Question 4 (extra work before or after school) 27 replies, or 49.1 per cent.
Question 14 (promotion by subjects) 24 replies, or 43.6 per cent.
Question 3 (tutoring as preparation for skipping a grade) 20 replies, or 36.4 per cent.
Question 10 (introduction of high school subjects into the grades) 19 replies, or 34.5 per cent.
Question 9 (segregation of graded bright children for specially rapid progress) 15 replies, or 27.3 per cent.
Question 6 (permission to supplement regular day school with work taken in evening schools) 9 replies, or 16.4 per cent.
Question 2 (ungraded classes for specially bright children) 9 replies, or 16.4 per cent.

Question 13 (elimination of certain subjects) 8 replies, or 14.5 per cent.
Question 15 (increasing length of school day) 8 replies, or 14.5 per cent.
Question 12 (credit for quality of work) 4 replies, or 7.3 per cent.
Question 16 (increasing the length of the school term) 3 replies, or 5.5 per cent.
Question 11 (elimination of the eighth grade) 1 reply, or 1.8 per cent.

The number and per cent of the affirmative replies to the various questions from the northeastern section are as follows, the percentages being based on the total of 113 cities:

Question 1 (irregular promotions) 69 replies, or 61.1 per cent.
Question 5 (carrying extra subjects during school hours) 64 replies, or 56.6 per cent.
Question 7 (summer school work) 52 replies, or 46 per cent.
Question 14 (promotion by subjects) 48 replies, or 42.5 per cent.
Question 10 (introduction of high school subjects into the grades) 47 replies, or 41.6 per cent.
Question 9 (segregation of graded bright children for specially rapid progress) 34 replies, or 30.1 per cent.
Question 3 (tutoring as preparation for skipping a grade) 31 replies, or 27.4 per cent.
Question 4 (permission to do extra work before or after school) 29 replies, or 25.7 per cent.
Question 8 (credit for outside work) 29 replies, or 25.7 per cent.
Question 6 (permission to supplement regular day school work with work in evening schools) 23 replies, or 20.3 per cent.
Question 2 (ungraded classes for specially bright children) 18 replies, or 15.9 per cent.
Question 15 (increasing length of school day) 8 replies, or 7.1 per cent.
Question 11 (elimination of the eighth grade) 7 replies, or 6.2 per cent.
Question 13 (elimination of certain subjects) 6 replies, or 5.3 per cent.
Question 12 (extra credit for extra quality of work done) 5 replies, or 4.4 per cent.
Question 16 (increasing length of school term) 5 replies, or 4.4 per cent.

The number and per cent of the affirmative replies to the various questions from the central section are as follows, the percentages being based on the total of 153 cities:

Question 5 (permission to carry extra subjects during school hours) 111 replies, or 72.5 per cent.
Question 7 (summer school work) 107 replies, or 70 per cent.
Question 1 (irregular promotions) 99 replies, or 64.7 per cent.
Question 14 (promotion by subjects) 83 replies, or 53.6 per cent.
Question 3 (tutoring as preparation for skipping a grade) 55 replies, or 36 per cent.
Question 4 (permission to do extra work before or after school) 55 replies, or 36 per cent.
Question 8 (credit for outside work) 53 replies, or 34.6 per cent.

Question 10 (introduction of high school subjects into the grades) 41 replies or 26.8 per cent.
Question 9 (segregation of graded bright children for specially rapid progress) 28 replies, or 18.3 per cent.
Question 6 (permission to supplement the regular day school with work in evening schools) 26 replies, or 17 per cent.
Question 2 (ungraded classes for specially bright children) 21 replies, or 13.7 per cent.
Question 15 (increasing length of school day) 17 replies, or 11.1 per cent.
Question 13 (elimination of certain subjects) 13 replies, or 8.5 per cent.
Question 12 (credit for quality of work) 11 replies, or 7.2 per cent.
Question 16 (increasing length of school term) 7 replies, or 4.6 per cent.
Question 11 (elimination of eighth grade) 2 replies, or 1.3 per cent.

Plan No. 7 (summer school work), therefore, is used in the largest number of cities making reply, and plan No. 16 (increasing the length of the school term) is used by the smallest number.

The largest percentage of affirmative answers from the southern section of states was on question 7, referring to summer school work. On that question 79.5 per cent of all the replies were affirmative. That plan had the largest percentage of affirmative replies also from the western section, 74.5 per cent. For the central section the per cent was 70, whereas for the northeastern section only 46 per cent were affirmative.

On question 1 (irregular promotions) the largest per cent of affirmative replies came from the western section of states. On question 2 (ungraded classes for specially bright children) the largest per cent came also from the western section. Also question 3 (tutoring as preparation for skipping a grade), and question 4 (permission to do extra work before or after school) had the largest per cent of affirmative replies from the western section. Question 5 (permission to carry extra subjects during school hours) had the largest percentage of affirmative replies from the central section; question 6 (permission to supplement the regular day school with work taken in evening schools), from the northeastern section; question 7 (summer school work), the largest from the southern section; question 8 (credit for outside work, such as music, Bible study, etc.), the largest percentage from the western section, the next largest on this particular question being from the central section of states, this per cent being 34.6 per cent, whereas from the western section the per cent was 63.6. The largest percentage of affirmative replies to question 9 (segregation of graded bright children for specially rapid progress) came from the northeastern section; to question 10 (introduction of high school subjects into the grades), from the northeastern section; to question 11 (elimination of the 8th grade), from the southern section, which gave 36.1 per cent, the next largest percentage of affirmative replies to this question coming from the northeastern section, which gave 6.2 per cent. To question 12 (credit for quality of work done, e.g. extra credit for extra quality of work) the largest number came from the southern section; to question 13 (elimination of certain subjects), from the western section; to question 14 (promotion by subjects), from the central;

to question 15 (increasing the length of the school day), from the western section; and to question 16 (increasing the length of the school term), from the western section.

The smallest percentage of replies from the southern section was to question 16 (increasing length of school term), 2.3 per cent. The smallest percentage from the western section was to question 11 (elimination of eighth grade), 1.8 per cent; the smallest from the central, to question 11 (elimination of 8th grade), 1.3 per cent; the smallest from the northeastern section, to question 16 (increasing the length of the school term), 4.4 per cent.

TABLE I.—REPLIES ACCORDING TO QUESTION AND ACCORDING TO GROUPS OF CITIES REPLYING

GROUP	QUESTION																Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
I..........	14	....	11	10	17	....	24	9	1	7	....	3	....	16	3	2	117
II..........	33	4	9	14	43	7	29	16	9	17	7	2	6	32	7	3	238
III.........	49	11	29	31	49	13	54	33	15	34	8	8	7	40	5	2	388
IV.........	40	11	24	23	40	6	41	23	17	16	8	8	5	26	7	....	295
V..........	68	13	34	32	69	18	67	32	23	28	8	3	11	48	12	7	473
VI.........	38	11	17	14	25	14	30	15	11	13	10	3	2	22	4	1	230
VII........	20	7	10	10	22	9	25	13	13	15	1	4	3	16	2	2	172
Total.....	262	57	134	134	265	67	270	141	89	130	42	31	34	200	40	17	1913

Table I is interpreted thus: In cities of Group I there were 14 affirmative replies to question 1; there were no affirmative replies to question 2; 11 affirmative replies to question 3; 10 to question 4; etc., or a total of 117 affirmative replies from cities of Group I.

On the basis of size of school unit reporting, the numbers and percentages of the affirmative replies distribute themselves as follows:

Group I (100 to 500 pupils)

Question 7 (summer school work), 24 replies, or 77.4 per cent.
Question 5 (extra subjects during school hours), 17 replies, or 54.8 per cent.
Question 14 (promotion by subjects), 16 replies, or 51.6 per cent.
Question 1 (irregular promotions), 14 replies, or 45.2 per cent.
Question 3 (tutoring as preparation for skipping a grade), 11 replies, or 35.5 per cent.
Question 4 (extra work before or after school), 10 replies, or 32.3 per cent.
Question 8 (credit for outside work), 9 replies, or 29 per cent.
Question 10 (introduction of high school subjects into the grades), 7 replies, or 26.6 per cent.
Question 12 (credit for quality of work), 3 replies, or 9.7 per cent.
Question 15 (increasing length of school day), 3 replies, or 9.7 per cent.
Question 16 (increasing length of school term), 2 replies, or 6.5 per cent.
Question 9 (segregation of graded bright children for specially rapid progress), 1 reply, or 3.2 per cent.

Group II (501 to 1,000 pupils)

Question 5 (carrying extra subjects during school hours), 43 replies, or 74.1 per cent.
Question 1 (irregular promotions), 33 replies, or 56.9 per cent.
Question 14 (promotion by subjects), 32 replies, or 55.2 per cent.
Question 7 (summer school work), 29 replies, or 50 per cent.
Question 10 (introduction of high school subjects into the grades), 17 replies, or 29.3 per cent.
Question 8 (credit for outside work), 16 replies, or 27.6 per cent.
Question 4 (permission to do extra work before or after school), 14 replies, or 24.1 per cent.
Question 3 (tutoring as a preparation for skipping a grade), 9 replies, or 15.5 per cent.
Question 9 (segregation of graded bright children for specially rapid progress), 9 replies, or 15.5 per cent.
Question 11 (elimination of eighth grade)), 7 replies, or 12.1 per cent.
Question 15 (increasing length of school day), 7 replies, or 12.1 per cent.
Question 6 (permission to supplement regular day school with work taken in evening schools), 7 replies, or 12.1 per cent.
Question 13 (elimination of certain subjects), 6 replies, or 10.3 per cent.
Question 2 (ungraded classes for specially bright children), 4 replies, or 6.9 per cent.
Question 16 (increasing length of school term), 3 replies, or 5.2 per cent.
Question 12 (credit for quality of work), 2 replies, or 3.5 per cent.

Group III (1,001 to 1,500 pupils)

Question 7 (summer school work), 54 replies, or 67.5 per cent.
Question 1 (irregular promotions), 49 replies, or 61.3 per cent.
Question 5 (permission to carry extra subjects during school hours), 49 replies, or 61.3 per cent.
Question 14 (promotion by subjects), 40 replies, or 50 per cent.
Question 10 (introduction of high school subjects into the grades), 34 replies, or 42.5 per cent.
Question 8 (credit for outside work), 33 replies, or 41.3 per cent.
Question 4 (permission to do extra work before or after school), 31 replies, or 38.8 per cent.
Question 3 (tutoring as preparation for skipping a grade), 29 replies, or 36.3 per cent.
Question 9 (segregation of graded bright children for specially rapid progress), 15 replies, or 18.8 per cent.
Question 6 (supplementing regular day school work with work taken in evening schools), 13 replies, or 16.3 per cent.
Question 2 (ungraded classes for specially bright children), 11 replies, or 13.8 per cent.
Question 11 (elimination of the eighth grade), 8 replies, or 10 per cent.
Question 12 (credit for quality of work done), 8 replies, or 10 per cent.
Question 13 (elimination of certain subjects), 7 replies, or 8.8 per cent.
Question 15 (increasing length of school day), 5 replies, or 6.3 per cent.
Question 16 (increasing length of school term), 2 replies, or 2.5 per cent.

Group IV (1,501 to 2,000 pupils)

Question 7 (summer school work), 41 replies, or 65.1 per cent.
Question 5 (extra subjects carried during school hours), 40 replies, or 63.5 per cent.
Question 1 (irregular promotions), 40 replies, or 63.5 per cent.
Question 14 (promotion by subjects), 26 replies, or 41.3 per cent.
Question 3 (tutoring as a preparation for skipping a grade), 24 replies, or 38.1 per cent.
Question 4 (permission to do extra work before or after school), 23 replies, or 36.5 per cent.
Question 8 (credit for outside work), 23 replies, or 36.5 per cent.
Question 9 (segregation of graded bright children for specially rapid progress), 17 replies, or 27 per cent.
Question 10 (introduction of high school subjects into the grades), 16 replies, or 25.4 per cent.
Question 2 (ungraded classes for specially bright children), 11 replies, or 17.5 per cent.
Question 11 (elimination of eighth grade), 8 replies, or 12.7 per cent.
Question 12 (credit for quality of work done), 8 replies, or 12.7 per cent.
Question 15 (increasing length of school day), 7 replies, or 11.1 per cent.
Question 6 (permission to supplement regular day school work with work taken in evening schools), 6 replies, or 9.4 per cent.
Question 13 (elimination of certain subjects), 5 replies, or 7.9 per cent.

Group V (2,001 to 4,000 pupils)

Question 5 (carrying extra subjects during school hours), 69 replies, or 69.7 per cent.
Question 1 (irregular promotions), 68 replies, or 68.7 per cent.
Question 7 (summer school work), 67 replies, or 67.7 per cent.
Question 14 (promotion by subjects), 48 replies, or 48.5 per cent.
Question 3 (tutoring as a preparation for skipping a grade), 34 replies, or 34.3 per cent.
Question 4 (carrying extra work before or after school), 32 replies, or 32.3 per cent.
Question 8 (credit for outside work), 32 replies, or 32.3 per cent.
Question 10 (introduction of high school subjects into the grades), 28 replies, or 28.3 per cent.
Question 9 (segregation of graded bright children for specially rapid progress), 23 replies, or 23.2 per cent.
Question 6 (supplementing regular day school with work taken in evening schools), 18 replies, or 18.2 per cent.
Question 2 (ungraded classes for specially bright children), 13 replies, or 13.1 per cent.
Question 15 (increasing length of school day), 12 replies, or 12.1 per cent.
Question 13 (elimination of certain subjects), 11 replies, or 11.1 per cent.

Question 11 (elimination of eighth grade), 8 replies, or 8.1 per cent.
Question 16 (increasing length of school term), 7 replies, or 7.1 per cent.
Question 12 (credit for quality of work), 3 replies, or 3 per cent.

Group VI (4,001 to 10,000 pupils)

Question 1 (irregular promotions), 38 replies, or 80.9 per cent.
Question 7 (summer school work), 30 replies, or 63.8 per cent.
Question 5 (carrying extra subjects during school hours), 25 replies, or 53.2 per cent.
Question 14 (promotion by subjects), 22 replies, or 46.8 per cent.
Question 3 (tutoring as a preparation for skipping a grade), 17 replies, or 36.2 per cent.
Question 8 (credit for outside work), 15 replies, or 31.8 per cent.
Question 4 (carrying extra work before or after school), 14 replies, or 29.8 per cent.
Question 6 (supplementing regular day school with work taken in evening schools), 14 replies, or 29.8 per cent.
Question 10 (introduction of high school subjects into the grades), 13 replies, or 27.7 per cent.
Question 9 (segregation of graded bright children for specially rapid progress), 11 replies, or 23.4 per cent.
Question 2 (ungraded classes for specially bright children), 11 replies, or 23.4 per cent.
Question 11 (elimination of the eighth grade), 10 replies or 21.3 per cent.
Question 15 (increasing length of school day), 4 replies, or 8.6 per cent.
Question 12 (credit for quality of work), 3 replies, or 6.4 per cent.
Question 13 (elimination of certain subjects), 2 replies, or 4.3 per cent.
Question 16 (increasing length of school term), 1 reply, or 2.2 per cent.

Group VII (10,001 to 100,000 pupils)

Question 7 (summer school work), 25 replies, or 80.6 per cent.
Question 5 (permission to carry extra subjects during school hours), 22 replies, or 71 per cent.
Question 1 (irregular promotions), 20 replies, or 65 per cent.
Question 14 (promotion by subjects), 16 replies, or 51.6 per cent.
Question 10 (introduction of high school subjects into the grades), 15 replies, or 48.4 per cent.
Question 9 (segregation of graded bright children for specially rapid progress), 13 replies, or 41.9 per cent.
Question 8 (credit for outside work), 13 replies, or 41.9 per cent.
Question 3 (tutoring as a preparation for skipping a grade), 10 replies, or 32.3 per cent.
Question 6 (supplementing the regular day school with work taken in the evening schools), 9 replies, or 29 per cent.
Question 4 (permission to do extra work before or after school), 10 replies, or 32.3 per cent.
Question 2 (ungraded classes for specially bright children), 7 replies, or 22.6 per cent.

Question 12	(credit for quality of work), 4 replies, or 13 per cent.
Question 13	(elimination of certain subjects), 3 replies, or 9.7 per cent.
Question 15	(increasing the length of the school day), 2 replies, or 6.5 per cent.
Question 16	(increasing the length of the school term), 2 replies, or 6.5 per cent.
Question 11	(elimination of the eighth grade), 1 reply, or 3.2 per cent.

In Group I (100 to 500 pupils) the highest percentage of affirmative answers was to question 7 (summer school work), 77.4; in Group II (500 to 1,000 pupils), to question 5 (carrying extra subjects during school hours), 74.1; in Group III (1,001 to 1,500 pupils), to question 7 (summer school work), 67.5 per cent; in Group IV (1,501 to 2,000 pupils), to question 7 (summer school work), 65.1 per cent; in Group V (2,001 to 4,000 pupils), to question 5 (carrying extra subjects during school hours), 69.7 per cent; in Group VI (4,001 to 10,000 pupils), to question 1 (irregular promotions), 80.9 per cent; in Group VII (10,001 to 100,000 pupils), to question 7 (summer school work), 80.6 per cent.

Great variation was shown in the answers to question 2 (ungraded classes for specially bright children)—from 0 in Group I (100 to 500 pupils) to 23.4 per cent in Group VI (4,001 to 10,000 pupils). Also to question 6 (supplementing the regular day school with work taken in the evening schools), ranging from 0 in Group I (100 to 500 pupils) to 29.8 per cent in Group VI (4,001 to 10,000 pupils) and to 29 in Group VII (10,001 to 100,000 pupils). Also in question 11 (elimination of eighth grade) ranging from 0 in Group I (100 to 500 pupils) to 21.3 per cent in Group VI (4,001 to 10,000).

In conclusion the following facts should be emphasized:

1. The questionnaire listed 16 different plans for shortening the period from the seventh to the twelfth grades inclusive;
2. The replies to the questionnaire did not suggest any other plan in practice, not enumerated in the original list;
3. A total of 1,363 questionnaires were sent out to the larger cities in each state of the Union;
4. Of these cities, 409, or 30 per cent of the whole number, sent in replies;
5. According to section of the country, 36 per cent of the cities of the central states filled out and returned the questionnaire; 35 per cent of the northeastern states; 26 per cent of the southern states; and 21 per cent of the western states;
6. On the basis of enrollment in schools, the distribution of replies was as follows:

24.7 per cent from cities enrolling from 2,001 to 4,000 pupils filled out and returned the questionnaires;
19.5 per cent from cities enrolling 1,001 to 1,500;
15.4 per cent from cities enrolling 1,501 to 2,000;
13.7 per cent from cities enrolling 501 to 1,000;
11.6 per cent from cities enrolling from 4,001 to 10,000;
7.5 per cent from cities enrolling 10,001 to 100,000;
7.5 per cent from cities enrolling 100 to 500.

7. Out of a possibility of 6,544 affirmative replies there were 1,913, or 29.2 per cent of the total possible. From 64 to 66 per cent of all replies answer in the affirmative question 1 (irregular promotions), question 5 (permission to carry extra subjects during school hours), and question 7 (summer school work).

From 30 per cent to 50 per cent of all replies answer in the affirmative question 10 (introduction of high school subjects into the grades), question 4 (permission to do extra work before or after school), question 3 (tutoring as a preparation for skipping a grade), question 8 (credit for outside work), question 14 (promotion by subjects), and from 10 per cent to 22 per cent question 11 (elimination of the eighth grade), question 2 ungraded classes for specially bright children), question 6 (supplementing the regular day school with work taken in evening schools), and question 9 (segregation of graded bright children for specially rapid progress). From 4 per cent to 10 per cent answer in the affirmative question 16 (increasing the length of the school term), question 12 (summer school work), question 13 (credit for quality of work), and question 15 (increasing the length of the school day).

8. Plan No. 7 (summer school work) is used in the largest number of cities making reply, and plan No. 16 (increasing the length of the school term) the smallest number.

9. The percentages of replies to the various questions were comparatively close together except in connection with question 4 (permission to do extra work before or after school), ranging from 25.7 per cent in the northeastern section to 49.1 per cent in the western section; question 7 (summer school work), ranging from 46 per cent in the northeastern section to 79.5 per cent in the southern section; question 8 (credit for outside work), ranging from 25.7 per cent in the northeastern section to 63.6 per cent in the western section; question 11 (elimination of the eighth grade), ranging from 1.3 per cent in the central section to 36.1 per cent in the southern section.

10. On the basis of the size of the school unit according to the enrollment, the percentages of affirmative replies to the various questions were largely the same, except in question 2 (ungraded classes for specially bright children), where the percentage ranged from 0 in Group I (100 to 500 pupils) to 23.4 per cent in Group VI (4,001 to 10,000 pupils); question 6 (permission to supplement the regular day school with work in the evening schools), ranging from 0 in Group I (100 to 500 pupils) to 29.8 per cent in Group VI (4,001 to 10,000 pupils); question 7 (summer school work), ranging from 50 per cent in Group II (500 to 1,000 pupils) to 80.6 per cent in Group VII (10,001 to 100,000 pupils).

TABLE II.—SHOWING TIME PLANS HAVE BEEN IN USE IN SCHOOL SYSTEMS BY SECTIONS OF THE COUNTRY

1 to 2 Years

SECTION	PLAN																Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
SS.........	10	3	5	7	10	3	11	15	5	9	....	2	2	8	4	1	95
WS.........	8	3	5	3	1	1	5	11	3	10	....	2	....	8	6	1	67
NES.......	5	6	7	1	5	6	14	13	6	11	....	2	....	9	6	3	94
CS.........	17	7	8	6	10	9	23	23	9	19	....	5	6	25	8	3	178
Total.....	40	19	25	17	26	19	53	62	23	49	....	11	8	50	24	8	434

3 to 5 Years

SS.........	16	4	9	7	21	....	27	5	4	4	....	3	....	14	1	....	115
WS.........	13	5	5	3	13	3	13	12	4	7	....	....	2	7	....	....	87
NES.......	23	9	10	10	18	3	18	10	11	18	....	2	2	9	2	2	147
CS.........	32	5	17	13	28	6	40	16	4	7	....	....	2	18	1	1	190
Total.....	84	23	41	33	80	12	98	43	23	36	....	5	6	48	4	3	539

6 to 10 Years

SS.........	10	....	6	1	11	....	8	2	....	3	....	1	2	7	1	1	52
WS.........	6	1	2	4	6	....	6	2	1	....	....	....	1	3	....	2	34
NES.......	21	1	5	5	12	2	4	....	2	8	....	....	2	10	....	2	75
CS.........	23	2	12	9	43	2	17	1	7	3	....	2	2	10	1	....	134
Total.....	60	4	25	19	72	4	35	5	10	14	....	3	7	30	2	5	295

11 to 20 Years

SS.........	3	....	....	2	1	....	2	....	....	....	....	1	....	4	1	....	14
WS.........	2	1	....	2	2	....	1	....	1	....	....	....	....	....	....	....	10
NES.......	13	....	5	4	13	....	5	1	4	5	....	1	1	11	....	1	63
CS.........	16	1	7	4	19	....	3	1	....	2	....	....	....	6	....	1	60
Total.....	34	2	12	12	35	....	11	2	5	7	....	2	1	21	1	2	147

The four parts of Table II are interpreted as follows: In the first column to the left, SS stands for southern states; WS for western states; NES for northeastern states; and CS for central states. Of cities of the southern states, therefore, that have been using one or more of these plans for from one to two years 10 have used plan 1, 3 have used plan 2; 5 have used plan 3, etc. The second, third, and fourth sections are to be interpreted just as the first section except that they apply to cities that have had these plans in operation for longer periods of time; the second section for a period of from 3 to 5 years; the third section for a period of from 6 to 10 years, etc.

TABLE III.—SHOWING TIME PLANS HAVE BEEN IN USE IN SCHOOL SYSTEM, BY SIZE OF SCHOOL UNIT REPORTING

1 to 2 Years

GROUP	PLAN																Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
I...........	2	....	2	3	4	....	3	6	....	5	....	1	....	6	2	1	35
II..........	8	2	2	3	5	1	7	6	3	7	....	....	2	9	4	2	61
III.........	8	4	8	3	4	4	9	15	4	20	....	3	3	11	4	....	100
IV.........	7	4	3	2	4	3	5	8	6	6	....	2	2	8	5	1	66
V..........	9	6	5	4	7	4	19	14	8	9	....	3	....	11	4	1	104
VI.........	4	2	4	2	1	4	7	5	1	1	....	2	1	3	3	1	41
VII........	2	1	1	....	1	3	3	8	1	1	....	....	....	2	2	2	27
Total.....	40	19	25	17	26	19	53	62	23	49	....	11	8	50	24	8	434

3 to 5 Years

I...........	5	....	1	3	6	....	11	1	....	1	....	1	....	5	....	....	34
II..........	9	1	5	2	19	1	12	8	1	4	....	....	....	10	....	1	73
III.........	15	4	8	9	17	3	23	7	3	5	....	2	2	10	....	....	108
IV.........	13	2	8	6	11	....	12	9	5	6	....	1	....	5	....	....	78
V..........	22	7	11	7	18	4	21	10	7	12	....	....	2	10	2	2	135
VI.........	16	6	6	3	5	2	9	4	5	3	....	1	....	6	1	....	67
VII........	4	3	2	3	4	2	10	4	2	5	....	....	2	2	1	....	44
Total.....	84	23	41	33	80	12	98	43	23	36	....	5	6	48	4	3	539

6 to 10 Years

I...........	3	....	2	1	3	....	1	....	....	....	....	....	....	1	....	1	12
II..........	5	1	....	1	9	....	....	....	1	....	....	....	....	4	....	....	21
III.........	11	1	4	2	11	....	6	1	3	3	....	1	1	7	....	2	53
IV.........	11	1	4	2	14	....	8	2	1	1	....	....	1	4	1	....	50
V..........	18	1	7	9	18	2	9	2	2	5	....	....	4	7	1	1	86
VI.........	6	....	4	2	11	1	5	....	1	2	....	1	1	4	....	....	38
VII........	6	....	4	2	6	1	6	....	2	3	....	1	....	3	....	1	35
Total.....	60	4	25	19	72	4	35	5	10	14	....	3	7	30	2	5	295

11 to 20 Years

I...........	....	....	....	....	2	....	1	....	....	....	....	1	....	....	....	....	4
II..........	....	....	....	2	4	....	....	....	....	1	....	....	....	1	....	1	9
III.........	7	....	5	2	7	....	1	....	....	1	....	....	....	1	....	....	24
IV.........	3	....	2	2	3	....	3	....	1	2	....	....	....	3	1	....	20
V..........	11	1	3	2	11	....	3	2	1	1	....	....	....	9	....	1	45
VI.........	5	....	....	1	3	....	1	....	1	1	....	....	....	2	....	....	14
VII........	8	1	3	3	5	....	2	....	2	1	....	1	....	5	....	....	31
Total.....	34	2	13	12	35	....	11	2	5	7	....	2	....	21	1	2	147

Tables IV and V summarize by sections and by groups the cities that give extra credit to pupils thru the operation of these various plans and the per cent of pupils receiving such extra credit.

TABLE IV.--SUMMARY BY SECTIONS OF CITIES GIVING EXTRA CREDIT TO PUPILS THRU THESE PLANS, AND PER CENT OF PUPILS RECEIVING EXTRA CREDIT

1 to 5 Per Cent

SECTION OF U. S.	PLAN																Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
SS.........	15	....	6	11	19	3	30	6	1	1	....	2	....	1	....	....	95
WS.........	12	3	2	7	10	2	16	8	2	....	....	....	....	....	....	....	62
NES.......	25	3	11	6	17	6	18	6	2	3	....	....	....	....	....	1	98
CS.........	52	7	22	16	48	7	31	9	2	2	....	1	....	....	....	....	197
Total.....	104	13	41	40	94	18	95	29	7	6	....	3	....	1	....	1	452
6 to 10 Per Cent																	
SS.........	5	2	6	1	11	....	9	2	2	1	....	....	....	....	....	....	39
WS.........	10	....	5	3	7	....	3	6	2	2	....	1	....	....	....	....	39
NES.......	10	3	4	1	11	1	6	2	1	1	....	2	....	....	....	....	42
CS.........	10	1	9	5	16	2	10	7	1	1	....	....	....	2	....	....	64
Total.....	35	6	24	10	45	3	28	17	6	5	....	3	....	2	....	....	184
11 to 20 Per Cent																	
SS.........	6	....	2	....	5	....	2	1	....	....	....	....	....	....	....	....	16
WS.........	2	1	1	....	1	....	1	4	2	1	....	....	....	....	....	....	13
NES.......	4	1	1	2	3	....	1	1	2	2	....	....	....	....	....	....	17
CS.........	6	1	1	....	8	....	6	3	1	1	....	1	....	1	....	....	29
Total.....	18	3	5	2	17	....	10	9	5	4	....	1	....	1	....	....	75
21 Per Cent and Over																	
SS.........	5	3	....	2	8	....	2	4	1	8	....	1	....	....	....	....	34
WS.........	6	4	2	3	5	....	3	5	....	9	....	....	....	....	....	....	37
NES.......	3	5	1	....	4	....	2	2	1	9	....	1	....	....	2	4	34
CS.........	3	1	....	....	9	....	4	6	1	12	....	1	2	....	....	2	41
Total....	17	13	3	5	26	....	11	17	3	38	....	3	2	....	2	6	146

Table IV is interpreted as follows: 15 cities from the southern states report from 1 to 5 per cent of their pupils profiting thru extra credit as a result of the operation of plan 1; 6 cities for plan 3; 11 for plan 4, etc. Six cities from the southern states report from 11 to 20 per cent of their pupils receiving extra credit as a result of the operation of plan 1; 2 cities report 11 to 20 per cent of their pupils profiting by extra credit thru the operation of plan 3, etc. Table V is interpreted just as Table IV with the exception that in the column at the left the figures I, II, III, IV, etc., stand for cities of Group I, II, III, IV, rather than for sections of the United States.

TABLE V.—SUMMARY BY GROUPS OF CITIES GIVING EXTRA CREDIT TO PUPILS THRU THESE PLANS, AND PER CENT OF PUPILS RECEIVING EXTRA CREDIT

1 to 5 Per Cent

Group	Plan																Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
I	4	....	5	1	7	....	7	....	....	1	....	....	....	....	....	....	23
II	13	....	2	6	25	2	9	4	1	....	....	....	....	....	....	....	62
III	22	3	13	12	22	4	28	8	2	1	....	1	....	1	....	....	117
IV	16	3	6	8	12	3	13	5	2	1	....	1	....	....	....	....	70
V	28	5	10	8	17	2	24	8	....	2	....	....	....	....	....	....	104
VI	13	2	4	1	5	3	6	2	1	....	....	....	....	....	....	1	38
VII	8	....	3	4	6	4	8	2	1	1	....	1	....	....	....	....	38
Total	104	13	41	40	94	18	95	29	7	6	....	3	....	1	....	1	452

6 to 10 Per Cent

I	3	....	2	1	2	....	2	3	....	....	....	1	....	....	....	....	14
II	4	1	4	1	5	....	3	3	1	2	....	....	....	....	....	....	24
III	7	....	6	3	11	....	4	3	3	....	....	1	....	1	....	....	39
IV	8	1	4	2	7	....	7	4	1	....	....	....	....	....	....	....	34
V	7	2	6	2	12	2	10	3	1	2	....	1	....	1	....	....	49
VI	5	1	1	1	5	....	1	1	....	1	....	1	....	....	....	....	17
VII	1	1	1	....	3	1	1	....	....	....	....	....	....	....	....	....	8
Total	35	6	24	10	45	3	28	17	6	5	....	4	....	2	....	....	185

11 to 20 Per Cent

I	2	....	....	....	3	....	....	....	....	....	....	....	....	....	....	....	5
II	1	1	....	....	4	....	1	3	1	....	....	....	....	....	....	....	11
III	2	....	1	....	2	....	1	....	....	1	....	1	....	....	....	....	8
IV	5	....	1	....	3	....	2	1	1	1	....	....	....	....	....	....	14
V	7	1	1	....	3	....	3	5	2	2	....	....	....	1	....	....	25
VI	1	1	2	2	1	....	3	....	....	....	....	....	....	....	....	....	10
VII	....	....	....	....	1	....	....	....	1	....	....	....	....	....	....	....	2
Total	18	3	5	2	17	....	10	9	5	4	....	1	....	1	....	....	75

21 Per Cent and More

I	1	....	....	2	4	....	2	3	....	3	....	....	....	....	....	....	15
II	3	1	....	....	2	....	....	1	....	4	....	....	....	....	....	1	12
III	4	2	1	....	5	....	1	5	....	15	....	3	1	....	....	....	37
IV	2	4	2	1	4	....	2	4	1	6	....	....	....	....	....	....	26
V	2	2	....	1	10	....	2	4	1	8	....	....	1	....	....	2	33
VI	3	2	....	1	....	....	1	....	1	....	....	....	....	....	....	1	9
VII	2	2	....	....	1	....	3	....	....	2	....	....	....	....	1	3	14
Total	17	13	3	5	26	....	11	17	3	38	....	3	2	....	1	7	146

TABLE VI.—SUMMARY OF PERCENTAGES FOR ALL THE PLANS

SECTION AND GROUP	GRADES			TIME					PER CENT EXTRA CREDIT				
	Elementary School	High School	Average	1 to 2 Years	3 to 5 Years	6 to 10 Years	11 to 20 Years	Average	1 to 5 Per Cent	6 to 10 Per Cent	11 to 20 Per Cent	21 Per Cent	Average
SS	15	17	16	6.6	8.0	3.6	1.0	4.8	6.6	2.7	1.1	2.4	3.2
WS	19	17	18	7.8	10.0	4.0	1.1	5.7	7.2	4.5	1.5	4.3	4.4
NES	16	12	14	5.2	8.2	4.2	3.5	5.3	5.5	2.3	1.9	2.0	2.4
CS	18	16	17	7.2	7.7	5.4	2.4	5.7	8.0	2.6	1.2	1.7	3.4
Average	17	15	16	6.6	8.2	4.3	2.2	5.3	6.9	2.8	1.1	2.2	3.3
I	12	13	12.5	7.1	6.9	2.5	1.0	4.4	4.7	2.9	1.0	3.0	2.9
II	14	14	14	6.8	8.1	2.3	1.0	4.5	6.9	2.7	1.2	1.3	3.0
III	19	15	17	7.7	8.3	4.1	1.9	5.5	9.0	3.0	.6	2.9	4.4
IV	18	15	16.5	6.4	7.6	4.0	1.9	5.0	6.8	3.3	1.4	2.5	3.5
V	17	16	16.5	6.4	8.3	5.3	2.8	5.7	6.4	3.0	1.5	2.0	3.2
VI	18	14	16	5.6	9.1	5.1	1.9	5.4	5.1	2.3	1.4	1.2	2.5
VII	20	18	19	8.2	8.6	6.8	6.0	7.4	7.4	1.6	.4	2.7	3.1
Average	17	15	16	6.6	8.2	4.3	2.2	5.3	6.9	2.8	1.1	2.2	3.3

Table VI is interpreted as follows: In the left-hand column SS stands for southern states, WS for western states, etc., just as in other tables; likewise in the lower section of the left-hand column, I, II, III, etc., stand for cities of Group I, Group II, Group III, etc. The 15 directly to the right of SS in the subcolumn headed Elementary School means that the actual number of cases where the plans are in operation in the elementary schools of the cities reporting from the southern section is 15 per cent of the number of cases there would be if all 16 plans were in operation in every city. It is obtained by dividing 220, the correct number of cases mentioned in Table II, by 16 times 90, the total possible number of cases, if all 16 plans were in operation in all the elementary schools of the 90 cities reporting from the southern states. Other percentages for the high school and averages are obtained in a similar manner.

The 6.6 per cent in the horizontal line to the right of SS and directly under the special heading, 1 or 2 years, under the general heading of Time means that 6.6 per cent of all the cities reporting reported one or more of these plans in operation for a period of not more than from 1 to 2 years previous to the report. The 6.6 per cent further to the right in the horizontal line following the SS and immediately under the special heading 1 to 5 under the general heading of Per Cent of Extra Credit means that 6.6 per cent of all the cities reporting reported from 1 to 5 per cent of all their pupils profiting by the operation of these plans for shortening the period of time from the seventh to the twelfth grades. Similarly the lower section of Table VI applies to cities by groups and may be interpreted in the same way.

On the average, 6.6 per cent of all the cities reporting report plans in use for a period of only 1 or 2 years previous to the time of the report; 8.2 per cent of the cities report plans in use for a period of from 3 to 5 years previous to the time of the report; 4.3 per cent of the cities report plans in use for a period of from 6 to 10 years; and 2.2 per cent report plans in use from 11 to 20 years. The average length of time for all cities reporting during which these plans have been in operation is 5.3 years. For cities of the southern states the average length of time is 4.8 years; for cities of the northeastern states 5.3 years; western and central states, 5.7 years; for cities of Group I, 4.4 years; for cities of Group VII, 7.4 years. Of all the cities reporting 6.9 per cent report from 1 to 5 per cent of their pupils benefited thru the operation of one or more of these plans. Of the cities reporting, 2.8 per cent report from 6 to 10 per cent of all pupils benefited by the operation of one or more of these plans; 1.1 per cent of all the cities reporting report from 11 to 20 per cent of their pupils benefited thru the operation of one or more of these plans; and 2.2 per cent of all the cities reporting report more than 21 per cent of their pupils benefited thru the operation of one or more of these plans.

A Systematic Plan for Selecting Subnormal and Supernormal Children in the Public Schools

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I WANT to describe very briefly what we are trying to do on this problem of grading the intelligence of children in the schools. I am going to assume that all of you are familiar with our blanks and that you saw the demonstration of testing which we gave yesterday,* and that you do not, therefore, need a detailed description of the tests. I will try only to tell you something of the way we have developed the tests and norms, and point out what I feel to be the most important features in our methods.

Professor Book has for some time been particularly interested in the problems of the supernormal child, and our plans for research for the year had centered around the development of group tests for the selection of specially gifted children. Then early last fall the department undertook the test work connected with the survey of a certain county, X, near here to determine the number of mental defectives in the county. We hoped to combine the two studies and to examine, at least in a preliminary way, all the children in each school of the county.

For such wholesale testing a carefully systematized method was essential. The method chosen was the one Professor Whipple has described to you, as employed by him—the use of group tests for first rough selection of extreme cases, followed up by careful individual examinations, where the results by the group tests indicated the need for such further study. About our method for individual study I need to say only a word. We naturally used the Stanford-Binet Scale. But I felt that the Terman blank was bulky, and distinctly unsatisfactory in other respects, so I developed the blank, copies of which have been here on the table. You will notice that it gives in the two inside pages all the tests up to the sixteen-year group. Those of you who are familiar with Binet blanks will see at once the advantage of thus having all, except the adult, tests before the examiner at once. Altho the blank has been thus condensed, it has been possible, by careful planning, to keep adequate space for recording replies wherever verbatim records are particularly valuable. On the back page of the folder you will see a space for supplementary tests. The tests of the Binet, as you know, are largely verbal; many children, especially those with speech defect and those from homes where English is not spoken, need a checking up of the Binet rating by trial with a few performance tests. So I have provided four or five simple tests that can be given readily with the

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* In Appendix, facsimile blank and directions.

Binet. The value of having such tests provided for, on the blank, I am sure you will all recognize.

I wish particularly, however, to call your attention to the case study outline on the first page of the blank.† Several years of intensive experience in the use of Binet tests, and in the supervision of other examiners, have made me feel very strongly the need of the average examiner for a carefully organized outline, which should definitely demand the gathering of information with regard to school history, health, environment, social status, and such other important factors as may condition one's conclusions in regard to the case. Systematic study of the case is quite as necessary as systematic examining. I have therefore tried to outline and closely organize the data necessary for a case study, grouping these points under five main heads, Physical Condition, Environment, Social Relationships, School Record, and then finally Mental Measurements. Certain of the items under each one of these heads you will notice are starred. The plan has been that an examiner in the first meeting with the case should obtain information with regard to these starred items, which would be sufficient to give something of a perspective in the way of case history to help in the interpretation of the test findings. If the case appears worth intensive study the further items should, so far as possible, also be covered.

I may say that we have found this blank very satisfactory, for the work both in the Bloomington schools and in the further studies of the survey. It is compact, convenient, easy to use. All the results are readily accessible for research. The material called for in the case study is of value to the examiner. It is absolutely essential for anyone else who may wish afterward to form an adequate estimate of the examination and the case.

So much for the organization of the case study, the first step in our program of mental survey. For the group examination much less was ready to hand. Such a set of tests as Whipple has described does not, as he would doubtless be the first to admit, make the coherent and compactly organized examination which would be suitable for the extensive testing we had undertaken. Certain other tests used extensively by Pyle have been employed by Pintner as part of a survey. But the tests used by Pintner and Pyle are of widely varying merit, both in convenience in giving and scoring, and in differential value. We felt that constructive research was called for. Tests of proven differential value in marking off mentally defective and particularly bright children must be collected, and these must be combined into a unified and carefully organized examination. It is the result of our efforts, thus far, toward the development of such an examination that I wish, particularly, to present to you.

Our method of trying out and selecting the tests may be briefly described. By the time we were ready to begin work on the group scale some of my students and I already had well under way a survey of the Bloomington schools, using Binet examinations, school records, teachers' estimates, and information secured by a social worker as the bases in an enumeration of the feeble-minded and the gifted children in the system. My wife and I made a special study of the children in the third and fifth grades of the Central school [Bloomington] and of a group of eighth grade children and high school sophomores. Each test was tried with these four sets of children. We required of each test, in the first place, that its beginning should be easy enough so that, roughly, nine-tenths of the 3B children should make some score, and that the end of each test should be hard enough so that no high school sophomore would make a perfect score—the items in each test being graded, as well as could be, from the results with these children. The tests were then selected according to their ability to differentiate, at each grade, the superior and the subnormal children (these diagnoses being made, as has just been said, on the basis of Binet examinations, teachers' estimates, and other independent criteria).

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† The first page of the blank is reproduced in the Appendix.

We thus obtained, as you will see, tests giving a satisfactory measure over a considerable range of ages, and giving results of a definite significance, as shown by correlation with independent data. Now just a brief word as to the tests which we found most valuable. The first is a memory test. It has been modified from one used by Pyle. Pyle reads a list of words to his children and asks them to write the list down from memory. Now it won't do, as Whipple has said—especially with young children—to have a test with very much writing. So we finally hit upon the idea of reading a list and then simply asking what word came after a given word. We would read a list like "mother, chair, think, best, rain" and then ask what word came after "think". You will readily see the advantage in economy of time and writing for the children, and in easier scoring so far as handling the material is concerned. Incidentally, the test is decidedly interesting, as it keeps the children guessing. Of 47 eight-year-olds only two failed to make some score on the test—that is, the test is readily understood even by the young children; of 91 sixteen-year-olds only one made a perfect score. The test then has a wide range of applicability, and so far as we can tell to date, it has a high differential value in separating the intellectually subnormal from the bright children.

The next test we call Logical Selection. It is practically original, tho we began with a modification of one of Bonsor's tests. It is, you might say, a test for the essence of a thing. We say for instance "Here is the word 'chair' and after it in small letters the words 'arm, cushion, legs, rockers, seat'. Now what two things in the list following 'chair' is a 'chair' never without?" and the children underline those two words. The test is of high differential value, can be readily graded, varied indefinitely in its material, and is one of the best we have.

The nature of the arithmetic test is obvious. Dr. Fernald, the well known superintendent of the Waverley School for the Feeble-Minded, Waverley, Mass., has a little test which he says no feeble-minded person can pass. He has the unfortunate habit of occasionally trying it on visitors. He simply asks a question somewhat like this: "Suppose you went down town, and you spent five cents on the way down, and you bought six postage stamps while you were there, and then spent five cents on the way back—and suppose you had a dollar to start out with—how much would you have left when you got back?" Dr. Fernald says that inability to do this sort of arithmetic (involving the holding in mind and manipulation of a number of items at once) is particularly characteristic of the feeble-minded. We built up our test about this idea of his.

The Opposites test needs no explanation. Our test of Logical Memory we are rather proud of: those of you who were present at the demonstration test Friday will remember that it consists of a newspaper article about a fire in East Chicago, which we read to the children. We then ask them some questions about the article read—twenty questions, ten of which deal with facts about the fire, and ten which were supposed to mislead them about the fire and the attendant circumstances. Thus we asked, "Is Harry five or ten years old?" when he is really seven. On such baits the dull children almost always bite, the bright one much less frequently. That is, the suggestion questions are the most differential. We are particularly proud of the test because we believe we have freed it almost entirely from the influence of such special factors as environment, age, or other irrelevant circumstances. You will remember that we were planning to use the tests in country schools. Talk about firemen, as in the Binet memory passage, will be relatively unfamiliar material for these country children. We have nothing of that sort, nothing that should not be quite as readily understood by a country boy as by a city urchin. Moreover, neither one of these boys would find it either childish or too mature. We have had too much of fairy tales, and fables about grasshoppers, and painfully obvious parables, in our memory passages for children. I have had some little experience with court cases where such tests were in the routine, and have had to give such "stuff" to slum children and girls off the street. It is painful. But there is nothing in this article about the fire that a country child would find unfamiliar, or that an adult would think childish, or a child stupid. The test has worked excellently.

The Word Completion test also needs no explanation. The children grasp the idea at once and enjoy puzzling over it. It is also a test which permits of the nicest gradation of items and offers an infinite variety of material.

The idea for the scoring of the Moral Classification test comes from Professor Thorndike's Visual Vocabulary Series. Recent research as to the differential value of the separate tests of the Binet Scale has shown that a test which calls for the definition of abstract moral ideas is of particular value. This test of ours is an attempt to work such a test into our group scale in a fashion that could be readily and unequivocally scored. The form of the test is not by any means wholly satisfactory; there is too much opportunity for accidental successes. But our results show that for children above twelve it is the most differential test we have.

The Dissected Sentences test also needs a little explanation. The idea is taken, of course, from the Binet test of the same name. We have arranged it so that the children can indicate their response without writing, and it works very well. This is the "puzzle" test of the series.

In our scale the Practical Information test offers recreation. There are ten lists of five words each. The first list runs, "water, wood, sand, iron, cork". The children are asked to "put a line under the thing that is heaviest, and a cross after the thing that is lightest". To take another sample, the eighth list reads "bill, coins, check, draft, stamps" and the children are asked to indicate the safest and the least safe way to send money. Each group of five words samples a different field of information. The test is interesting and, as some one of you remarked yesterday, "great fun".

The Analogies test, again, needs no comment. But I should like to point out a special feature of this test and the Opposites test. We have, for the most part, formed our tests so that no writing is required. But Professor Terman, as some of you know, puts much stress on the value of a test of vocabulary: the Terman-Childs vocabulary test is, he states, the most reliable test of the Stanford-Binet Scale. So we have, by requiring the children to choose their own words to make the opposites and complete the analogies, made these tests tests of vocabulary as well as of controlled association. It takes longer for the children to do the test and the scoring is harder. But we felt that there ought to be a gain in differential value over the same test when put so that the children merely underline or check the right word.

Those are the tests. Now just a word about the organization of the scale as a whole. I have already told you how, in developing the tests, we made certain that each test was applicable over the range of ages to which we wished to give it, and about how (trying, of course, in the first place only types of tests which were of proven worth) we had determined for ourselves the comparative differential value of the tests experimented with. As a first point with regard to the organization of the scale as a whole I may mention, then, the carefully determined and similar ranges of applicability of the tests making up the scale. In the second place, there is what I might call the organization of the scale psychologically. There is, I am sure you will grant, unusual variety and an unusual amount of intrinsic interest in the tests. They are tests which naturally hold the attention. I may say that we have not found a single class which did not enjoy taking the examination—an attitude in marked contrast to the feeling shown by the same children toward other tests, particularly certain tests of achievement that I might mention. If you will look carefully at the examination, you will see that tests where the child is given the directions once for all, and then left to go thru the test by himself, alternate with tests where the child is carried along, so to speak, by the examiner, is given the test item by item. This insures again greater variety, it gives greater opportunity for control of the children, keeps the examiner in closer touch with them. The method of giving the directions is also to be mentioned. Here, particularly, there is constant coöperation and interplay between examiner and pupil—opportunity for question and answer, and a bit of individual attention. The skilful examiner thus finds the examination flexible enough to permit of a close control of the class, and a ready stimulation to concerted effort, which would be impossible with a more set method.

Our efforts toward what I have just called a satisfactory organization of the scale, psychologically, I feel to be the most distinctive part of our plan. But we have also tried to organize for one other purpose, for convenience in both practical work and research. We need, badly, more research in this field. The lack of adaptability of the Binet results to research treatment is one of the most unfortunate features of the method. Our tests are all readily scored as absolutely right or wrong. With a little practice, and the use of a convenient score card or a stencil, the whole examination can be scored and rated in less than three minutes. Each test has twenty items. There are ten tests or a total of 200 items or points. The convenience of this arrangement for statistical work, or for tabulation by test and analytical study, is obvious.

I see I have spent my time in telling you about our tests, and have only a moment to indicate roughly what we have done with them. But our charts of norms will explain themselves for the most part. We have obtained, as our first standard, results from 664 Bloomington school children in grades 3-8 inclusive, and grouped the results by both age and grade.* Our results so far are not complete (we have not yet examined the high school) and I shall not trouble you with further figures. I wish only to mention two or three bits of fact which we have discovered, which indicate something as to the reliability of the scale for measuring degrees of mental ability.

Age	No. cases	10 percentile	Median	90 percentile	Grade	No. cases	10 percentile	Median	90 percentile
8	53	37	63	87	3	116	28	52	81
9	92	40	71	108	4	99	42	65	94
10	96	44	93	124	5	96	73	98	114
11	114	62	105	141	6	108	88	110	136
12	117	82	116	148	7	123	103	124	146
13	111	95	127	155	8	122	112	133	156
	583					664			

You are probably curious as to why we have calculated the ten and ninety percentiles. You remember that we had planned the group scale as a means of first selection of cases which should be considered suspicious, in a survey to determine the number of mental defectives in the schools. The question at once arises as to the efficiency of the scale in performing this service. Can we (the question is) find the cases which deserve intensive study more quickly and more accurately, by means of the group scale, than by other means? We have calculated the ten percentiles because we have found no case rating on the Binet with an Intelligence Quotient below 76 who scored above the ten percentile on the group test. As a matter of fact no such cases scored above the eight percentile. If we may trust Professor Terman, we will not find feeble-minded children with I.Q.'s above 70; if we take the I.Q.'s 76 or below we include the lower three per cent of the total distribution of ability. It seems a fair argument, then, that the lower ten per cent on our group scale includes all cases which might be suspected of feeble-mindedness.*

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* It should be mentioned that we have considered children as twelve years old who were anywhere between their twelfth and thirteenth birthdays, and so on for each year. The norms are, therefore, norms for twelve years and a half, thirteen years and a half, etc.

But in the survey we were not searching simply for children with I.Q.'s below 70, as such; we were trying to discover feeble-minded of institutional grade. So we decided to try our tests at the State School for Feeble-minded Youth at Fort Wayne. The institution has 416 cases 18 years of age or below. Of these only three were able to make a rating above the lowest ten percentile of the school children of the same ages. One of these three has a Stanford-Binet rating of 78, for the other two no Binet ratings are available. All three cases are orphan asylum children; the orphan asylums are, they say at the school, the source from which they obtain their brightest children. Only five of these institutional cases show a rating above the five percentile for the schools. For practical purposes, then, the ten percentile would seem a reliable limit. There would appear to be a practical certainty that a child in the public schools who scored above the ten percentile for his age was not a mental defective.

Could not, you will ask, a similar, or better, preliminary selection be made by the teachers? In most instances the experienced teacher can, with much definiteness, point out those of her children who are mental defectives. But she makes mistakes too; a docile, quiet, backward child is often liked by the teacher, and estimated by comparison with the younger children, who make up the majority of the class rather than with the normal child of the same age. So we found, here in Bloomington, three feeble-minded children who were omitted from the teachers' lists of dullest fifth of the class! In the country the group tests are much more needed; the teachers are often inexperienced, the pupils new to them, and the teachers' estimates of their pupils are highly unreliable. The group tests perform, then, a definite service in search for mental defectives in the schools.

But perhaps you are not particularly interested in means of selecting feeble-minded and brilliant children; you have no special means, in your school system, for dealing with these exceptional children if they *were* indicated to you, and can see no great value in making such special efforts to find them. I wish in closing to say that I feel, myself, that such group tests are likely to be of greatest use, in the schools, for other purposes. Dr. Book will illustrate to you some of these uses. But let me point out, very briefly, two of them.

In junior high schools more recognition is taken, than in the grades, of differences in ability. In many such schools the entering class is, in the first week of school, divided into sections on the basis of ability, as estimated by the teachers at that time. In the course of the year the teachers discover that they have made not a few mistakes in their selection of children for bright, dull, and average sections, and many transfers are made. Would not group tests such as these I have described to you, if given in the fall, help in making up sections, and lessen the number of transfers necessary during the year? In order to estimate roughly as to whether "ability such as is needed for a good section", and "ability which necessitates a child's being placed in a poor section" is measured by the tests, we have tabulated the scores from the Bloomington Junior high school, according to section, as these sections were toward the end of the year (in April). The boys of the 6B and 7B grades are divided into two sections. In 6B out of twenty-two in the poorest section, only two do as well on the tests as the average boy in the bright group; in 7B the proportion is four out of thirteen. In 8B there are three sections of boys. Not one in the poor section does as well as the average in the bright group; only two in the bright group score below the brightest of the dull section! I cannot stop to tell you more of these results. But may I suggest that the use of group tests of intelligence in junior high schools, as an aid in the sorting of children according to ability, is distinctly worth trying?

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* We also have some evidence to suggest that the upper ten per cent may include all of the children whom Terman considers brilliant, or the upper three per cent. So we have calculated the 90 percentile.

There is one other use of the group tests I should particularly like to see tried. We found that the range of the grade distributions for one Bloomington school averaged about ten per cent greater than the ranges for another school. In other words, one school had selected about ten per cent more accurately, so far as general ability went, for its grades. Other things being equal, the more alike the children in a class are, the easier the teaching and the better the work. If, in a given class, there are, on the other hand, some very dull and some very bright children, the teacher has to spend extra time on the dullards, and the very bright youngsters haven't enough work to "keep them out of mischief". The school's ability to select accurately and grade evenly its classes is thus a matter of no small importance for educational efficiency. And I believe such group tests offer a unique means for measuring a school's ability in thus sorting its material. We hope soon, I may say, to have more material on this point.

Variations in Mental Ability and its Distribution among the School Population of an Indiana County

William F. Book, Professor of Educational Psychology, and Director of the Psychological Laboratory, Indiana University

I. PROBLEM

There are three types of tests which should be developed by the University and used by the school authorities of the state: (1) Tests to measure the progress which children make in the various school subjects, achievement tests, which enable us to measure readily and accurately the rate of learning in these subjects. Our previous conferences have dealt chiefly with such learning or achievement tests. By means of such tests we are able to measure the efficiency of our instruction, and we should follow up our measurements with studies which will reveal how the learning actually takes place so that the causes of the progress or lack of progress in learning which such tests reveal may be determined. (2) A second sort of scale or test is needed to determine the native endowment or general intelligence of the pupil material we have to work with. The best thing that any superintendent or teacher can do is to develop to the fullest extent the varying talents of his pupils. If we would adapt our schools and the work of instruction to the needs and capacities of our pupils we must have scales and tests which will enable us to determine accurately and practically the general intelligence or native ability of our pupils. (3) It is also important to determine, in a scientific way, the vital index or total amount of available energy possessed by our pupils, and I believe that some day we will have scales or methods of determining the vital capacity of school children as we now have means for determining their general intelligence. Such tests are needed to keep parents and teachers from overworking children in school and so interfering with their healthy growth and development.

I desire to report very briefly some results which we have obtained from a study made in the second field of investigation mentioned—the development and use of intelligence tests—to which the discussions of this conference have been almost entirely devoted. Dr. Pressey has already described the series of tests that were used in our mental survey of county X. He has told you how this Group Point Scale for measuring intelligence was developed and given some reasons why we believe this examination is reliable as a practical instrument for classifying pupils in the public schools on the basis of their native intellectual ability. I shall in this report give an account of the variations in native endowment found among the school population of county X, and indicate briefly how these different grades of intelligence are distributed thruout the county.

II. METHOD

The mental examination, which Dr. Pressey has just described, has been given to all pupils in the Bloomington schools, grades 3 to 8 inclusive, and to all pupils in the same grades in 77 country and village schools of Monroe county. The tests were given in all the schools of nine townships and all pupils present on the day the tests were given have been examined. In each school, before the examination was given, the teacher was asked to make out a list of her brightest and dullest pupils in grades 1 to 8. These were given a special individual examination using the Stanford Revision of the Binet Scale. Those belonging to grades 3 to 8 were given the group intelligence tests. Wherever the group examination indicated that a pupil, not on the teacher's list of dull or bright pupils, was exceptionally dull or bright, he was given a Binet Test and the results of the two examinations compared. In the Bloomington and country schools of county X 341 individuals were thus given an individual Binet examination, and 1,165 pupils in the Bloomington and country schools of Monroe county were given our group tests. This number does not include the pupils from the Central school of Bloomington whose group test scores are not included in the following results because our group tests were tried out on the pupils of this school while the scale was being developed and revised. The results from this group of pupils could, therefore, not be compared with the results of the examination of the 1,165 pupils in the other schools of the city and county. With the exception of the pupils from this school and the pupils in the one-room schools of three of the twelve townships of the county whose schools closed before the tests were ready, every school in the county was tested.

III. RESULTS

I shall group the results under the following heads: (1) the individual differences in mental ability which our examinations revealed, and the distribution of varying grades of intelligence among the school population of the county; (2) the amount of mental deficiency and accelerated mental ability found in different sections of the county or the distribution of feeble-mindedness and superior intelligence among the school population of the county; (3) differences between country and city as regards native ability of their school children; (4) the adjustment of the schools of the county to these differences in the mental endowment of their pupils.

1. INDIVIDUAL DIFFERENCES IN MENTAL ABILITY

Careful examination by the Binet method, of large numbers of individuals, and the use of intelligence tests in the army have shown that people may be classified on the basis of an intelligence rating into the following classes: (1) those possessing *very superior intelligence*, comprising about 2 to 5 per cent of the total population; (2) those possessing *superior intelligence*, comprising about 8 to 10 per cent of the total population; (3) a group possessing a *high average* intelligence and including about 15 to 18 per cent of the total population; (4) those possessing *average intelligence*, including about 25 per cent of the total population; (5) a group possessing a *low degree of average intelligence*, including about 20 per cent of the total population; (6) a group possessing *inferior intelligence*, comprising about 15 per cent of the total population; and (7) a group possessing *very inferior intelligence*, made up of the lowest 10 per cent of the population, including the moron and feeble-minded classes not in institutions.

Taking the total distribution of our group test scores for pupils of all ages in the entire county or for any particular age or grade, and dividing up this distribution range on the basis of the above percentages and counting the number of pupils whose group test scores fall in these several sections of the total distribution range, we get curves for each of these groupings identical in form with a distribution curve drawn on the above basis.* We have, therefore, thrown our results in this form because it gives us a practical and suggestive method of comparing groups of pupils possessing varying degrees of mental ability. The 5 per cent of pupils obtaining the highest scores for any age or grade group are considered for purposes of this report as *A* pupils, possessing the highest grade of intelligence of the group, that is, *A* or *very superior intelligence*, the next highest 10 per cent as *B* pupils possessing the next grade or *superior intelligence*, etc., to the *E* group of pupils, possessing the lowest grade, or *very inferior intelligence*. This method of showing the variations in mental ability indicated by our mental examinations will be generally used thruout this report.

a. Variations in the Mental Ability of Pupils Belonging to the Same Age Groups

(1) Range of Variability. Tables I and II show the variations in score for pupils belonging to the same age groups. Table I shows the variations in score of pupils at the various mental levels indicated, in the Bloomington schools. Table II shows the scores obtained by *A*, *B*, *C+*, *C*, *C—*, *D*, and *E* pupils in the country and village schools of Monroe county. The median score for each age and group is shown in the eighth column of the tables. These median scores may be considered as tentative norms for the several age groups.

The facts revealed by these tables are striking indeed. For example: (1) *A* pupils 8 and 9 years old show higher scores and by implication have greater native ability than *D* and *E* pupils 11, 12, 13, 14, and 15 years old. (2) *A* and *B* pupils 9 and 10 years old are as able as *C*, or average pupils, 12, 13, 14, and 15 years old, that is to say, as able as the average pupil two to three years older. Even *C* pupils 8 and 9 years old are equal in native ability to *E* pupils (the dullest 10 per cent in the elementary school grades) 13 and 14 years old. (3) The brightest pupil 8 years old got a higher score than *C* pupils of any age from 9 to 15 inclusive and better than *C* or average pupils 10 and 11 years old. (4) The brightest 3 per cent of 10-year-old pupils got better scores than *C* or *C*+ pupils of all higher ages, as high, even, as *B* pupils, 11 to 15 years of age, who were in the same school grades.* (5) All *A* pupils 11 years old got better scores than *B* pupils 12, 13, 14, and 15 years old.

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* The parallel is not absolute for each particular age and grade group, due, no doubt, to the fact that our groups of school children are not truly representative of the entire population. The dullest pupils 8, 9, and 10 years of age were in the first and second grade and so were not examined by our group scale tests. Many 14-and-15-year-old pupils in the county have dropped out of school and so were not examined. This no doubt accounts for the fact that our distribution curves are a little higher for the C+, C, and C— groups than the 25, 15, and 20 per cent thought to be normal. See actual distribution tables for these middle sectors of the distribution curve.

TABLE I.—Comparison of Mental Ability of Pupils in Same Age Groups—Data for Bloomington Schools

Ages	Average Score For							Median Score For Age	Number Pupils In Group*
	E Pupils	D Pupils	C— Pupils	C Pupils	C+ Pupils	B Pupils	A Pupils		
8.....	25	44	56	66	74	87	100	67	54
9.....	26	47	58	73	86	104	124	74	95
10.....	30	57	74	91	111	122	139	93	94
11.....	31	67	90	111	129	139	147	105	113
12.....	57	90	104	118	133	145	160	116	118
13.....	78	102	115	125	134	145	165	125	97
14.....	60	98	110	121	135	146	156	122	78
15.....	88	101	112	124	137	145	150	115	29

*The scores of fifteen pupils of 7, 16, and 17 years of age are not included in data for this table.

TABLE II.—Comparison of Mental Ability of Pupils in Same Age Groups—Data for Country Schools

Ages	Average Score For							Median Score For Age	Number Pupils In Group*
	E Pupils	D Pupils	C— Pupils	C Pupils	C+ Pupils	B Pupils	A Pupils		
8.....	15	20	27	52	70	80	90	50	13
9.....	12	27	46	66	77	94	107	58	42
10.....	15	34	49	72	84	104	121	62	85
11.....	31	55	77	92	108	123	133	89	83
12.....	34	53	79	101	118	124	136	97	85
13.....	47	79	107	109	121	137	143	107	68
14.....	57	79	98	116	134	142	152	110	49
15.....	62	96	110	118	133	141	145	117	37

*Ten pupils 16 and 17 years of age are not included in data for this table.

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* It should be borne in mind in this connection that the brightest pupils in the county 14 and 15 years of age are in high school or have dropped out of school and so were not tested.—The variations in ability are, therefore, most reliable for ages 10, 11, and 12. The dullest children 7, 8, and 9 years old are in the first and second grades and so were not tested by our "group scale tests".

(2) Amount of Variation Shown. Some idea of the amount of variation in ability found among pupils of the same age may be gotten from such facts as the following:

1. Six 9-year-old children in the Bloomington schools got better scores than the average 12-year-old pupils, and, conversely, eight 12-year-old pupils got scores which fell below the average score for the 9-year-old group.

2. *A* pupils in the Bloomington schools get scores on our mental examination which are on the average from two to five times as high as the scores of the dullest 10 per cent, or *E* pupils, of the same ages.[*] The group test scores for *A* pupils 8 to 14 years of age are on the average 3.4 times as high as the score for *E* pupils of the same ages. *A* pupils in the country schools get scores which are 2 to 9 times as high as the scores made by the dullest, or *E* pupils, of the same ages.

The accompanying Table III compares the scores of *A* and *E* pupils for all age groups in both the city and country schools.

TABLE III.—AMOUNT OF DIFFERENCE SHOWN BY POOREST *(E)* AND BEST *(A)* PUPILS IN THE SEVERAL AGE GROUPS

In Bloomington Schools

AGE		TOTAL NUMBER IN GROUP
8	*A* pupils get score averaging 4. times as high as *E* pupils.....	54
9	*A* pupils get score averaging 4.8 times as high as *E* pupils.....	95
10	*A* pupils get score averaging 4.6 times as high as *E* pupils.....	94
11	*A* pupils get score averaging 4.7 times as high as *E* pupils.....	113
12	*A* pupils get score averaging 2.8 times as high as *E* pupils.....	118
13	*A* pupils get score averaging 2.1 times as high as *E* pupils.....	97
14	*A* pupils get score averaging 2.6 times as high as *E* pupils.....	78
15	*A* pupils get score averaging 1.7 times as high as *E* pupils.....	29

Average for all ages 3.4.

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[*] These and the following figures should not be thought of as amounts in total endowment or absolute mental ability. They do not mean that the pupils in our *A* group have exactly five times as much total native ability as the pupils in our *E* group. This could only be the case if we had a scale which was a perfect measure of such total or absolute ability, which we do not claim to have. Our scale would also have to start at the zero point of such absolute ability, and be perfectly graded so that each point or step in advance on the scale was of the same degree of difficulty, measuring an equal amount of such absolute ability. This is not the case. What our figures do mean is amount of variation or difference in actual points made upon our scale by the particular groups of pupils tested and compared. When so measured the pupils whose scores place them in the highest 5 percentile group show up for certain ages five times as well as the pupils whose scores place them in the lowest 10 percentile or *E* group. We are a long way from possessing scales which measure total endowment or absolute mental ability. Our series of tests enables us to select pupils with marked mental ability and to distinguish them from pupils of meager ability and to distinguish the more important grades of ability in between. (See section IV below. Also Journal of Applied Psychology, September, 1918, article by S. L. Pressey, pp. 266-69.) We do not know what such differences mean in terms of total native endowment or absolute ability.

In Country Schools

AGE		NUMBER PUPILS IN GROUP
8	*A* pupils get score averaging 6. times as high as *E* pupils.....	13
9	*A* pupils get score averaging 9. times as high as *E* pupils.....	42
10	*A* pupils get score averaging 8. times as high as *E* pupils.....	85
11	*A* pupils get score averaging 4.3 times as high as *E* pupils.....	83
12	*A* pupils get score averaging 4. times as high as *E* pupils.....	85
13	*A* pupils get score averaging 3. times as high as *E* pupils.....	68
14	*A* pupils get score averaging 2.7 times as high as *E* pupils.....	49
15	*A* pupils get score averaging 2.3 times as high as *E* pupils.....	37

Average for all ages 5.

A comparison of the scores made by *A* and *C* pupils in the same age groups, ages 8 to 15 inclusive, gives the following results: *A* pupils in the Bloomington schools get scores 1.51, 1.70, 1.52, 1.32, 1.35, 1.32, 1.30, and 1.20 times as high as the average or *C* pupils of the same ages, with an average of 1.40 for all age groups. This average for the pupils in the country schools was a little higher, 1.47 times, running for ages 8 to 15 inclusive, as follows: 1.73, 1.62, 1.70, 1.44, 1.34, 1.31, 1.31, and 1.23.

No school system can or should neglect such differences in its pupil material. The fact that such marked differences in ability occur between city and country children is due to the fact that large numbers of feeble-minded pupils were found in the schools of certain townships, which seems to have pulled down the score for the country groups. The *A* pupils in the country showed scores which were on the average 5 times as high as for *E* pupils. In Bloomington *A* pupils made scores which were only 3.4 times as high as *E* pupils. (Compare also section on Distribution of Feeble-Mindedness and Superior Intelligence, below.)

b. Variations in the Mental Ability of Pupils in the Same School Grades

(1) Range of Variability. Tables IV and V show the range of variations in the mental ability of pupils in the same school grades. Table IV indicates the variations in mental ability which occur among pupils in the same grades of the Bloomington schools. Table V shows the scores of *A*, *B*, *C*+, *C*, *C*—, *D*, and *E* pupils in the same grades of the country and village schools of Monroe county. The median scores for each grade group is shown in column eight of the tables and may be thought of as a tentative norm for the several grade groups. The following significant facts are revealed by these tables:

1. *A* pupils in the third grade, the best 5 per cent, get as good or better scores as *E* pupils (the lowest 10 per cent) in grades 7 and 8 and as good as *C* and *C*— pupils in grade 5.

2. *A* pupils in grade 4 have more ability, if we may trust our scores, than *C* pupils (the middle 25 per cent) in grade 6. Even *B* students in the fifth and sixth grades make better scores than *C*— and *D* students in the seventh and eighth grades.

3. *A* and *B* pupils in grades 3 and 4 are equal in ability to *C* pupils in grades 5 and 6. In fact *A* and *B* students in any grade group appear to be about equal in mental ability to the average, or *C* pupils, in the second grade above them.

4. In the Bloomington schools *A* students in the different grades get scores which average from 1.5 to 5.5 times as high as the scores of the lowest 10 per cent or *E* pupils in the same school grades.

5. These differences become less for both city and country pupils as we pass from grade 3 to grade 8. It is greatest for grades 3 and 4 and least for 7 and 8, a very significant fact, since it is well known that feeble-minded pupils rarely advance in school beyond the third and fourth grade.*

TABLE IV.—Comparison of Mental Ability of Pupils in Same Grade Groups—Bloomington Schools

Grades	Average Score For							Median Score For Grade	Number Pupils In Group
	E Pupils	D Pupils	C— Pupils	C Pupils	C+ Pupils	B Pupils	A Pupils		
3.....	18	34	46	61	70	80	95	56	117
4.....	27	41	63	70	83	92	109	70	101
5.....	58	75	88	97	104	113	120	96	95
6.....	75	94	107	117	126	135	141	115	151
7.....	96	107	115	126	137	143	153	127	113
8.....	95	113	124	134	146	153	166	132	116

TABLE V.—Comparison of Mental Ability of Pupils in Same Grade Groups—Country Schools

Grades	Average Score For							Median Score For Grade	Number Pupils In Group
	E Pupils	D Pupils	C— Pupils	C Pupils	C+ Pupils	B Pupils	A Pupils		
3.....	9	20	26	44	56	73	93	37	50
4.....	20	40	52	72	84	92	109	61	118
5.....	47	62	78	80	98	113	123	82	76
6.....	61	84	97	109	118	128	136	107	95
7.....	60	90	103	116	124	131	140	113	59
8.....	80	105	119	130	139	146	154	127	74

(2) The Amount of Variation in Mental Ability shown by pupils in the same grade groups is indicated by our distribution tables (XX and XXI) and by the variations in actual scores shown in Table VI.

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* These differences, to be sure, are not absolutely reliable since the points on our scale are not of identical value but our scale is well enough graded to make these comparisons significant.

TABLE VI.—AMOUNT OF DIFFERENCE SHOWN BY THE SCORES OF THE BEST *(A)* AND POOREST *(E)* PUPILS IN THE SEVERAL GRADE GROUPS

In Bloomington Schools

GRADE		NUMBER PUPILS IN GROUP
3	*A* pupils get scores which average 5.3 times as high as *E* pupils..	117
4	*A* pupils get scores which average 4. times as high as *E* pupils..	101
5	*A* pupils get scores which average 2.1 times as high as *E* pupils..	95
6	*A* pupils get scores which average 1.9 times as high as *E* pupils..	151
7	*A* pupils get scores which average 1.6 times as high as *E* pupils..	113
8	*A* pupils get scores which average 1.7 times as high as *E* pupils..	116

Average for all grades 2.8.

In the Country and Village Schools

GRADE		NUMBER PUPILS IN GROUP
3	*A* pupils get scores which average 10 times as high as *E* pupils..	50
4	*A* pupils get scores which average 5.4 times as high as *E* pupils..	118
5	*A* pupils get scores which average 2.6 times as high as *E* pupils..	76
6	*A* pupils get scores which average 2.2 times as high as *E* pupils..	95
7	*A* pupils get scores which average 2.3 times as high as *E* pupils..	59
8	*A* pupils get scores which average 1.9 times as high as *E* pupils..	74

Average for all grades 4.1.

A similar comparison of *A* and *C* students belonging to the same grade groups gives the following results:

TABLE VII.—COMPARISON OF *A* AND *C* STUDENTS IN SAME GRADE GROUPS

In the Bloomington Schools

GRADE		NUMBER PUPILS IN GRADE TESTED
3	*A* pupils get score 1.56 times as high as *C* pupils............	117
4	*A* pupils get score 1.56 times as high as *C* pupils............	101
5	*A* pupils get score 1.24 times as high as *C* pupils............	95
6	*A* pupils get score 1.20 times as high as *C* pupils............	151
7	*A* pupils get score 1.21 times as high as *C* pupils............	113
8	*A* pupils get score 1.23 times as high as *C* pupils............	116

Average for all grades 1.33.

In the Country Schools

GRADE		NUMBER PUPILS IN GRADE TESTED
3	*A* pupils get score 2.1 times as high as *C* pupils............	50
4	*A*.pupils get score 1.5 times as high as *C* pupils............	118
5	*A* pupils get score 1.5 times as high as *C* pupils............	76
6	*A* pupils get score 1.3 times as high as *C* pupils............	96
7	*A* pupils get score 1.2 times as high as *C* pupils............	59
8	*A* pupils get score 1.2 times as high as *C* pupils............	74

Average for all grades 1.47.

2. DISTRIBUTION OF FEEBLE-MINDEDNESS AND SUPERIOR MENTAL ABILITY AMONG THE SCHOOL POPULATION OF COUNTY X

To determine the number of pupils in the schools of county X with *very inferior intelligence* (feeble-minded) and *very superior intelligence* and to locate all such individuals for further examination and study, Binet tests were given to the dullest and brightest pupils in each school in the county. Three hundred and forty-one pupils in grades 1 to 8 were thus individually examined using the Stanford Revision of the Binet scale. The results of this examination were compared with teachers' estimates, school records, and, where possible, with our group test scores. A careful examination of the family was also made by a social worker. Our mental diagnosis for feeble-mindedness and superior intelligence was, therefore, based not merely upon the results of a Binet examination, but upon an exceedingly careful examination of each individual case.* In fact, our results, because of their unusual character, have been regarded with suspicion and all the data gone over several times to make sure of the soundness of our conclusions.

a. Amount of Feeble-mindedness in Different Townships of the County

The per cent of feeble-minded children in the total school population of nine townships in county X runs as follows:

Townships	1	2	3	4	5	6	7	8	9
Per cent of its school children who are feeble-minded	20	11	7	2	4	3	2	5	4

Township 1 heads the list with 20 per cent of its total school population feeble-minded. Townships 2 and 3 also show an abnormally high per cent of feeble-minded. Township 1 is in an out-of-the-way corner of the county, not touched by any railroad. It even lacks a rural free delivery route. The land is very unproductive, the people show an astounding amount of mental and moral degeneracy. Townships 2 and 3 border on township 1 and the mental defectives found in these two townships live for the most part in the sections adjoining township 1. The large number of mental defectives found in these three townships is, therefore, due to the fact that we have in an out-of-the-way corner of the county a sterile district inhabited chiefly by a few degenerate families who make up the greater proportion of the paupers, petty criminals, and feeble-minded folk of the community. The average number of feeble-minded in these first three townships is 13 per cent. The average for the rest of the county, exclusive of these three townships, is between three and four per cent. For the county seat, 12,000 inhabitants, it is only two per cent.

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* Data on these points were obtained from the entire county, including the pupils from the Central school of Bloomington and the pupils from every school district of the county.

b. Number of Mentally Deficient Children in Individual Schools

The facts revealed by a careful examination of individual schools are more striking still. One little school in township 1 had 19 pupils present when our tests were given. Of these, 11, or 56 per cent, were feeble-minded. Of these 11, 7 belonged to one family, counting cousins. Another school in township 8 had 13 pupils attending: 4 were feeble-minded. In another country school 10 children took our group tests and made an average score of 52 points. The average score for pupils of the same ages for the county was 83. Four individuals in this school were, upon further examination, found to be feeble-minded. In another country school, 7 pupils took our group test examination and made an average score of 126 points. The average score for pupils of the same ages for the county was 107.

Marked differences in mental ability among the pupils attending different schools in Bloomington, buildings X, Y, and Z, were also revealed. In these three schools 135 children were given a Binet intelligence test. These pupils were selected from the list of pupils rated by their teachers as exceptionally dull or bright or because our group test scores indicated that they possessed *very superior or very inferior intelligence.* In selecting these individuals an effort was made to test individually all pupils in the schools who were thought to be exceptionally dull or bright. The figures in Table VIII indicate that marked differences exist in the mental ability of the pupils attending these three schools. Buildings X and Y had, for example, 27 per cent and 30 per cent of *A* and *B* pupils, building Z only 13 per cent. Of the pupils tested in buildings X and Y 35 per cent and 23 per cent, respectively, belong to the *D* and *E* intelligence level; in building Z, 51 per cent of the pupils tested belong to the *D* and *E* group.

TABLE VIII.—DISTRIBUTION OF 135 PUPILS FROM THE THREE BLOOMINGTON SCHOOLS AMONG VARIOUS MENTAL LEVELS

SCHOOL	GROUP						
	A	B	C+	C	C—	D	E
	Per cent with very superior intelligence I. Q. 120–140	Per cent with superior intelligence I. Q. 110–120	Per cent with high normal intelligence I. Q. 100–110	Per cent with low normal intelligence I. Q. 90–100	Per cent with inferior intelligence I. Q. 80–90	Per cent with very inferior intelligence I. Q. 70–80	Per cent definitely feeble-minded I. Q. below 70
X.	15	12	7	11	20	23	12
Y.	17	13	13	13	20	13	10
Z.	10	3	7	10	20	35	16

c. Distribution of Pupils with Very Superior Intelligence

Pupils with *very superior* intelligence were found in almost every section of the county. Nineteen pupils were found in the Bloomington schools with an I.Q. over 120. One pupil was picked out by our group tests in school Z who gave by Binet examination an I.Q. of 135. Another pupil was found in school Y with an I.Q. of 134. One boy who had not even been selected by his teacher as one of her brightest pupils was found in a one-room country school who, when tested by the Binet method, gave an Intelligence Quotient of 134, as high as any pupil found in the county. He was selected for individual examination because his group test score was higher than the median score for pupils 3 and 4 years older. The individual examination showed this rating to be correct. He had not been discovered by his teacher because he was advanced in his school standing two grades and was doing only a little better than average work in this grade.

All these facts are of special significance for teachers and school officials. The teacher in some of the schools of the county is confronted with a problem which is unsurmountable by the ordinary methods of teaching. If you were to go thru the schools of county X with the Courtis Arithmetic tests, for example, and try to estimate the teachers' work according to the results obtained from the use of these tests, you would do the teachers of the schools where 56 and 33 per cent of the pupils were feeble-minded a fundamental injustice. They cannot show average results for the simple reason that one-half to a third of their pupils are feeble-minded and so are incapable of doing the work. The schools in townships 1 and 2 and some other individual schools in the county present very special problems, which demand careful and special consideration by school officials. It is clearly impossible to understand the educational problems presented by such a county as X without accurate intelligence ratings and a careful study of the variations in native endowment of its pupil material.

3. DIFFERENCES BETWEEN CITY AND COUNTY AS REGARDS NATIVE ABILITY OF SCHOOL POPULATION

That some rather marked differences exist in the native stock from which the school population in the country and city schools is drawn, is shown by the per cent of feeble-minded individuals that were found in each group. As already pointed out, schools were found in certain rural districts of the county where 56 per cent of the pupils, attending school on the day of the examination, had to be diagnosed as feeble-minded. One entire township had one feeble-minded child in every 5 pupils in its public schools; another had one in 9, another one in every 14 pupils. A careful survey of the entire county was made, as already described, to determine the exact number of mental defectives (feeble-minded, imbeciles, idiots, insane, and epileptic) in the county. This survey showed that of all pupils attending the public schools in the county seat 2 per cent were clearly feeble-minded. The average for

TABLE IX.—Age Norms for Country and City Children Compared[*]

Age	Score for Pupils in	Average Score for							Median Score for Age	Number Pupils in Group
		E Pupils	D Pupils	C— Pupils	C Pupils	C+ Pupils	B Pupils	A Pupils		
8	Country.	15	20	27	52	70	80	90	50	13
	City.....	25	44	56	66	74	87	100	67	54
9	Country.	12	27	46	66	77	94	107	58	42
	City.....	26	47	58	73	86	104	124	74	95
10	Country.	15	34	49	72	84	104	121	62	85
	City.....	30	57	74	91	111	122	139	93	94
11	Country.	31	55	77	92	108	123	133	89	83
	City.....	31	67	90	111	129	139	147	105	113
12	Country.	34	53	79	101	118	124	136	97	85
	City.....	57	90	104	118	133	145	160	116	118
13	Country.	47	79	107	109	121	137	143	107	68
	City.....	78	102	115	125	134	145	165	125	97
14	Country.	57	79	98	116	134	142	152	110	49
	City.....	60	98	110	121	135	146	156	122	78
15	Country.	62	96	110	118	133	141	145	117	37
	City.....	88	101	112	124	137	145	150	115	29

[*] The figures in this and Table X should not be thought of as absolute norms. The number of pupils in the extreme groups (E and A) are too small and the individual variations too great to make the figures reliable as norms. The medians and average scores do, however, indicate clearly the marked differences which our results reveal, between country and city pupils.

the county outside the county seat was 6.4 per cent. Three townships showed no greater amount of feeble-mindedness than did the school population of Bloomington. The other townships showed from 2 to 10 times as high a percentage of feeble-minded as did the county seat.

Other marked differences are shown. If we take the years 8 to 13 inclusive for the city and the country we find that only 24 per cent of the country children rate above the medians for the city and only 2 per cent score above the highest 10 percentile of the city children. Of the country children 27 per cent rate below the lowest 10 percentile for the city. I do not, of course, mean to imply that only 24 per cent of these

TABLE X.—Grade Norms for Country and City Children Compared

Grade	Score for Pupils in	Average Score for							Median Score for Age	Number Pupils in Group
		E Pupils	D Pupils	C— Pupils	C Pupils	C+ Pupils	B Pupils	A Pupils		
3	Country.	9	20	26	44	56	73	93	50	50
	City.....	**18**	**34**	**46**	**61**	**70**	**80**	**95**	**56**	**117**
4	Country.	20	40	52	72	84	92	109	61	118
	City.....	**27**	**41**	**63**	**70**	**83**	**92**	**109**	**70**	**101**
5	Country.	47	62	78	80	98	113	123	82	76
	City.....	**58**	**75**	**88**	**97**	**104**	**113**	**120**	**96**	**95**
6	Country.	61	84	97	109	118	128	136	107	95
	City.....	**75**	**94**	**107**	**117**	**126**	**135**	**141**	**115**	**151**
7	Country.	60	90	103	116	124	131	140	113	59
	City.....	**96**	**107**	**115**	**126**	**137**	**143**	**153**	**127**	**113**
8	Country.	80	105	119	130	139	146	154	127	74
	City.....	**95**	**113**	**124**	**134**	**146**	**153**	**166**	**132**	**116**

country children have native intelligence above the average ability of the city child. Other factors than lack of native ability very possibly played a part in causing the country children to score as low as they did. But when we take into consideration the facts about the distribution of feeble-mindedness in the county described above, we may, I think, with reasonable assurance conclude that our group test scores (rearranged in Tables IX and X so the raw scores of country and city children may be readily compared) give a fair indication of the differences in mental ability which exist between the school populations of the two sections.

The country districts of county X are hilly and the soil for the most part is unproductive and, as already pointed out, there is every reason to believe that there is in parts of the county a large proportion of degenerate stock. This would tend to pull down the average for the country districts as a whole. We may, therefore, conclude that our group test scores give us a reasonably fair method of comparing the mental endowments of the two groups of children. They at least furnish us the best means of making such comparisons which we now have. Incidentally, these facts throw important light on the much-discussed question whether city or country children are brighter in school and make the greater success in life. It clearly depends upon the character of the native stock from which they come. The children in *three* townships of the county show up as well as the pupils in the city of Bloomington with all the children from the University homes in the schools. Other townships had 5 to 10 times as many feeble-minded children per hundred population as the city of Bloomington. Children from these districts would make a poor showing in comparison with the pupils from the city of Bloomington or the townships where only 2 per cent of the school population is feeble-minded.

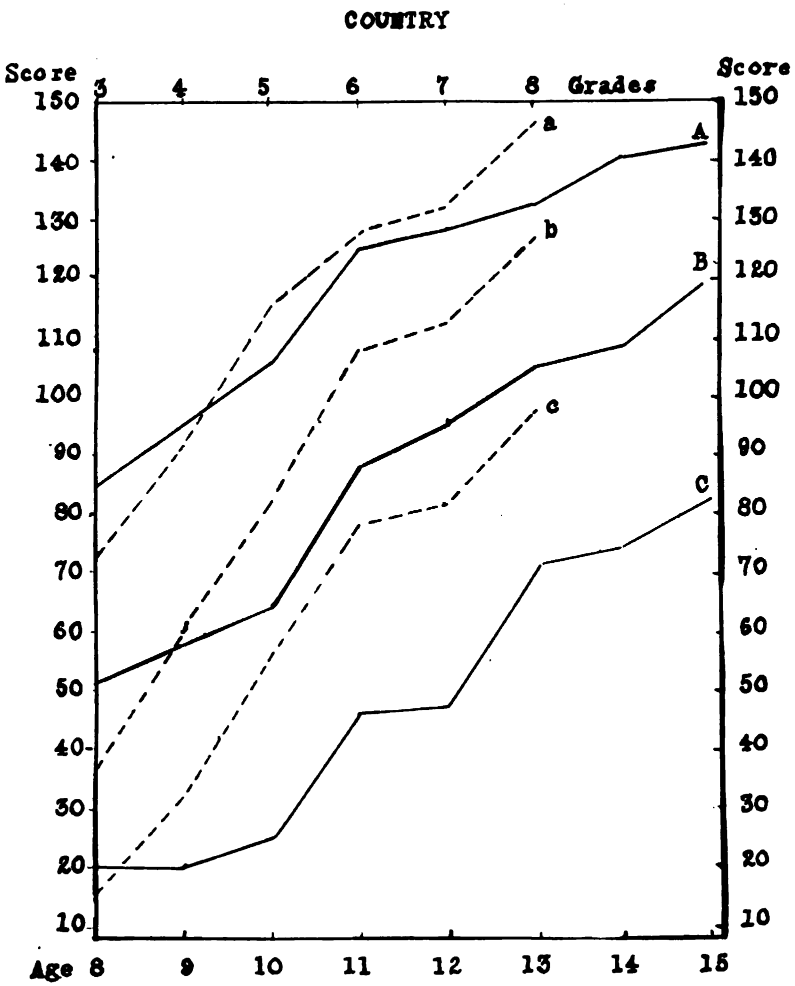

FIG. 1. DISTRIBUTION GRADE AND AGE—COUNTRY

4. ADJUSTMENT OF THE SCHOOLS IN COUNTY X TO THE VARYING ABILITIES OF THEIR PUPILS

The most important practical question is: How have the schools of the county adjusted themselves to the varying degrees of mental ability found among their pupils? We have heard much about the educational value and significance of the parable of the talents. Are the pupils of county X placed by the school in the grade where they can do the best

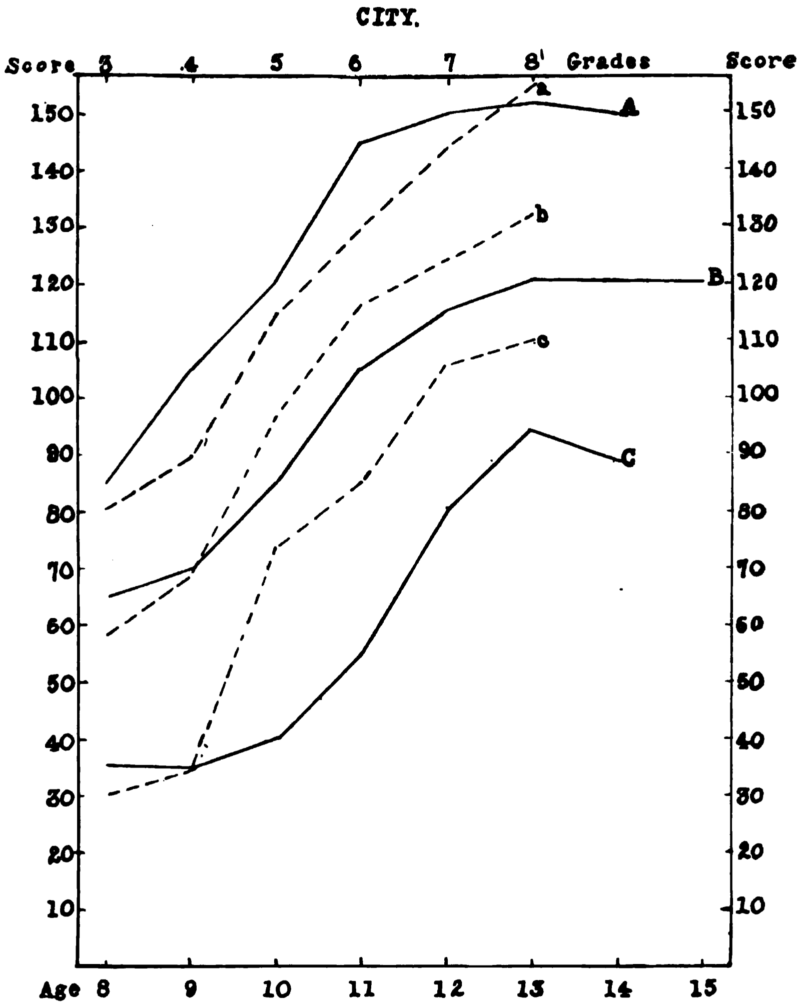

FIG. 2. DISTRIBUTION BY GRADE AND AGE—CITY

work? Are the brighter pupils advanced in school in proportion to their ability? Do they get a chance to go as fast as their native ability will permit them to go? Are the duller pupils advanced more rapidly than their capacity for learning and advancement warrants?

a. Location or Placement of the Pupils of Varying Degrees of Intelligence in the Schools of the County

(1) Most Pupils in the County are Properly Placed by the Schools. That the schools of the county have succeeded to a marked degree in adapting their work to the abilities of their pupils is shown by such facts as the following:

1. Our tables representing the exact distribution of pupils on the basis of mental ability, or group test scores for the different age and grade groups, show that the distribution is much more narrow for the grade than for the age groups in both the city and the country schools. (See Figures 1 and 2 above.) The schools have, therefore, adapted themselves somewhat to the mental differences in their pupil material. The dull children have been held back and the brilliant children given extra promotions with the result that the children in a given grade are more alike in mental ability than the children of a given age. For the Bloomington schools, where the best adaptations have been made, the distributions by age are about 10 per cent wider for the general age group than the distributions by grade. For the country schools, where the adaptations of the schools to the mental differences in their pupil material is not so good, the difference is somewhat less. It, therefore, tells more about a child's intelligence to say that he is in a certain grade than to say that he is 9 or 12 years old. Figures 1 and 2 show these differences in age and grade distribution for both the city and country schools. In each figure the small letters, a, b, c, show the grade distributions, and the capital letters, A, B, and C, show the age distributions.

2. The adjustment of the schools to the mental differences in pupil material is further shown by the fact that pupils accelerated* in their school standing one or more years get, on the whole, higher scores on our group tests than the median score for their grade and, conversely, pupils retarded one or more years in their school standing make lower scores than the median score for their grade. (See Table XI, compare also Table XII.)

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* In this report pupils were counted accelerated in their school standing if they were younger than the normal age for the grade in which they were placed. They were counted retarded if they were one or more years older than the normal age for their grade. Pupils were considered at age if they started to school when six years old and advanced one grade each year. On this basis 9 years was considered as the normal age for third, 10 for fourth, 11 for fifth grade pupils, etc. Our examinations were given in March and April. Pupils were asked to state their exact age at the time they were examined. It was therefore thought that this method would indicate the facts in regard to their school standing as well or better than any other method which might be used to indicate retardation and acceleration in school standing.

TABLE XI.—Intelligence Scores of Pupils Accelerated One to Three Years in School Standing Compared With Scores of Pupils Retarded One or More Years in School Standing (1,165 Cases)

In Bloomington Schools (693 cases)

Grade	Median score for pupils accelerated 2 and 3 years	Median score for pupils accelerated 1 year	Median score for grade	Median score pupils at age	Median score pupils retarded 1 year	Median score pupils retarded 2 and 3 years	Total number in grade
3	65	60	56	48	52	39	117
4	79	70	71	66	68	44	101
5	105	101	96	97	92	85	95
6	117	121	115	112	112	107	151
7	136	121	127	129	113	108	113
8	149	138	132	127	125	110	116

In Country Schools (472 cases)

Grade	Median score for pupils accelerated 2 and 3 years	Median score for pupils accelerated 1 year	Median score for grade	Median score pupils at age	Median score pupils retarded 1 year	Median score pupils retarded 2 and 3 years	Total number in grade
3	...	44	37	50	30	25	50
4	74	71	61	68	67	48	118
5	102	81	82	87	80	83	76
6	106	107	107	104	101	95	95
7	129	122	113	110	91	114	59
8	...	132	127	135	119	101	74

3. Again most pupils, 71 and 63 per cent respectively, accelerated in their school standing one or more years, fall, when rated by our group test scores, in the highest 10 and 20 percentile groups for their grade; only 13 and 14 per cent of this group were retarded in their school standing. The rest were normally placed or at age. Conversely, most pupils, 53 and 51 per cent respectively, who are retarded in their school standing one or more years, fall, when rated by our group intelligence scores, into the lowest 10 and 20 percentile groups for their grade; and only 24 and 20 per cent of the students whose group test scores place them in these lowest percentile groups were accelerated in their school standing. The rest were normally placed or at age. (See Table XII.) It is also significant that the amount of retardation is greater for the pupils, whose intelligence score places them in the lowest 10 and 20 percentile groups for their grade, than for the pupils whose intelligence scores place them in the middle or higher percentile groups. It also appears, from Table XII, that the pupils who get the best intelligence scores show the greatest *amount* of acceleration in school standing. And, vice versa, those who got the lowest scores on our intelligence tests show a decreasingly less amount of acceleration in their school standing.

TABLE XII.—PER CENT OF PUPILS IN BLOOMINGTON SCHOOLS WITH VARYING DEGREES OF MENTAL ABILITY WHO ARE RETARDED AND ACCELERATED IN SCHOOL STANDING

Pupils whose group test score places them in:	Per cent of group retarded in school standing	Per cent of group at age or normally placed by the school	Per cent of group accelerated in school standing	Total amount of retardation in years	Total amount of acceleration in years	Total number pupils in group
Lowest 10 Percentile.	53	23	24	1.96	1.06	69.3
Lowest 20 Percentile.	51	29	20	1.67	1.21	138.6
20–40 Percentile.	26	33	41	1.39	1.10	138.6
Median 20 Percentile.	19	34	47	1.17	1.35	138.6
60–80 Percentile.	16	30	54	1.14	1.39	138.6
Highest 20 Percentile.	14	23	63	1.07	1.35	138.6
Highest 10 Percentile.	13	16	71	.97	1.28	69.3
Total number of pupils...	....	....	....	....	....	693

4. The pupils in the Bloomington schools who have been regularly or double promoted, i.e. pupils in grades 6B to 8A of the Junior high school, get much higher intelligence scores than the pupils of the same ages who have been left behind in the 3d, 4th, and 5th grades of the ward schools of this city, showing that the brighter pupils in the Bloomington schools have, in the main, been rightly advanced or placed by the schools, and the duller pupils held back.* The pupils thus advanced beyond their fellows get higher scores than the medians for their ages and in the main equal to or higher than the medians for the grades in which they have been placed by the school. (Compare Table XIII.)

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* The Bloomington schools have for a number of years tried to select the brighter pupils for extra promotion. The brighter pupils have been grouped together and given a chance to finish their work as rapidly as they could. The duller pupils have been grouped together and made to go slower. That their method of selection has been mainly successful is shown by the facts of this section. That many individual mistakes have been made is amply clear by the facts which follow.

TABLE XV.—Average Age and Group Test Scores of Pupils of Various Abilities in the Grades of the Bloomington Schools

Grade	Score and Average Age	Lowest 10 Percentile	Lowest 20 Percentile	20–40 Percentile	Median 20 Percentile	60–80 Percentile	Highest 20 Percentile	Highest 10 Percentile
4B	Average Age..	10.7	10.2	9.46	9.18	9.37	9.37	9.6
	Medium Score	**33**	**42**	**56**	**66**	**73**	**89**	**91**
4A	Average Age..	11.18	11.34	10.	9.73	9.11	10.34	10.2
	Medium Score	**22**	**36**	**63**	**72**	**90**	**96**	**104**
5B	Average Age..	12.	11.5	11.	10.8	9.8	10.	10.
	Medium Score	**69**	**74**	**87**	**97**	**103**	**117**	**118**
5A	Average Age..	12.34	12.62	11.92	10.77	10.77	10.85	10.50
	Medium Score	**70**	**73**	**88**	**97**	**103**	**114**	**122**
6B	Average Age..	12.34	12.17	11.34	11.42	11.17	10.58	10.17
	Medium Score	**80**	**89**	**101**	**113**	**118**	**138**	**138**
6A	Average Age..	13.25	13.	12.1	11.5	11.8	11.6	12.
	Medium Score	**85**	**92**	**110**	**118**	**128**	**139**	**142**
7B	Average Age..	12.2	13.	12.3	12.3	12.3	11.7	11.8
	Medium Score	**97**	**106**	**120**	**130**	**141**	**146**	**153**
7A	Average Age..	13.9	13.7	13.3	12.57	13.	12.25	12.14
	Medium Score	**100**	**103**	**112**	**120**	**131**	**142**	**142**
8B	Average Age..	15.	14.25	13.71	13.	12.57	12.93	12.71
	Medium Score	**94**	**104**	**121**	**132**	**145**	**154**	**159**
8A	Average Age..	14.6	14.78	14.44	14.22	13.78	13.5	13.6
	Medium Score	**111**	**118**	**129**	**136**	**145**	**160**	**164**

pupils got scores higher than the median for the fourth grade above the one in which they were located. Approximately one-fourth of all the children in the country and city schools, 23.7 and 23.5 per cent respectively, got scores on our mental examination higher than the median score for the first grade above them, and 7 per cent of all pupils in the county and city schools got an intelligence rating higher than the median for the second grade above the one in which they were placed. (Compare Table XVI.) One cannot help but feel that

TABLE XVI.—NUMBER OF PUPILS MAKING SCORES ABOVE MEDIANS FOR ONE, TWO, AND THREE GRADES ABOVE THE ONE IN WHICH THEY ARE LOCATED

GRADE		Number pupils with scores higher than the median for next higher grade	Number pupils with scores higher than the median for second grade above them	Number pupils with scores higher than the median for third grade above them	Number pupils with scores higher than the median for fourth grade above them	Total number of pupils in grade
3......	Country..	6	3	0	0	50
	City......	**39**	**2**	**0**	**0**	**117**
4......	Country..	34	4	1	0	118
	City......	**9**	**2**	**1**	**0**	**101**
5.... ..	Country..	11	8	1	0	76
	City......	**10**	**1**	**0**	**0**	**95**
6......	Country..	34	11	1	0	95
	City......	**36**	**23**	**1**	**0**	**151**
7......	Country..	10	1	0	0	59
	City......	**40**	**8**	**3**	**2**	**113**
8......	Country..	16	4	3	0	74
	City......	**28**	**12**	**11**	**7**	**116**
Total..	Country..	111	31	6	0	472
	City......	**162**	**48**	**26**	**9**	**693**
Per cent whole	Country..	23.73	6.5	1.25	0	
	City......	**23.5**	**7.**	**3.75**	**1.3**	

a difference, so marked, between the ability shown by a child, and the standard of ability which the school sets for the grade in which the child has been placed, is evidence against the flexibility of the grade organization of that school and proof that the school is not adapting itself to the real needs of such pupils.

2. What is more striking still, we found among the pupils in the Bloomington schools 48 children who were retarded in their school standing, but who nevertheless made intelligence scores higher than the median score for the grade next above what would be their normal grade. Retardation is always an unfortunate phenomenon, but when

the school retards children who show a native ability, not merely above the average for their normal grade, but above the median for the grade next above what would have been their normal grade, we have a situation which surely cannot but be unfortunate for both pupil and class. It might well be argued that no child should be retarded if he shows ability above the average for his normal grade, yet there were 103 such cases among the 693 pupils tested in the Bloomington schools. But what shall we say when pupils retarded in their school standing show mental ability equal to that of the grade next above what would be their normal grade? This surely is evidence that such pupils have not been properly served by the school and that they should be tried in the grade where they seem to belong.

3. Again, all grades in the Bloomington schools except those of the Junior high school had pupils retarded in their school standing whose intelligence scores placed them in the highest 10 percentile group for their normal grade. Taking all the grades together, 13 per cent of all children whose intelligence score placed them in the highest 10 percentile group for their grade were retarded in their school standing one or more years, 70 per cent of this group of pupils were accelerated one or more years in their school standing. The rest were placed by the school in their normal grade. (Compare Table XII.) This certainly argues that some of the pupils belonging to this group have been poorly served by the schools. In fact, we may say that 30 per cent of this group of pupils were misplaced (those retarded and in their normal grade), unless sickness, absence from school, or other causes account for their backward location in the school. All such pupils need to be located and carefully studied to ascertain why they are not placed in the school grade where their mental ability indicates they belong.

(b) Some pupils are advanced too rapidly by the schools—more rapidly than their mental ability seems to warrant.

1. Every grade in the Bloomington and country schools had pupils advanced one or more years in their school standing beyond the point where their intelligence rating indicated they should be placed. For example, there were in the Bloomington schools 26 pupils (in the country schools 22) who showed intelligence ratings below the median for the second grade below the one in which they were located. One-fifth of all the pupils in the city and country schools of the county, 22 and 20 per cent respectively, made lower scores than the medians for the grade below the one in which they were placed by the school. Some pupils in both the city and country schools made scores below the median score for the third grade below the one in which they were located. (Compare Table XVII.) Our results, therefore, show that more than 25 per cent of the children in the schools of the county have apparently been advanced in their school standing one or more grades beyond the point warranted by their mental ability or intelligence score. The indication is that all such children have been wrongly placed by the schools, that they have been carried along with their classes, when they should have been kept back with children more like themselves in ability.

TABLE XVII.—NUMBER OF PUPILS MAKING SCORES BELOW MEDIAN FOR ONE, TWO, OR THREE GRADES BELOW THE ONE IN WHICH THEY ARE LOCATED

GRADES		Number pupils with scores lower than median 1 grade below them	Number pupils with scores lower than median 2 grades below them	Number pupils with scores lower than median 3 grades below them	Total number of pupils in grade
4.......	Country.......	17	No norms	No norms	118
	City...........	**25**	No norms	No norms	**101**
5.......	Country.......	11	0	No norms	76
	City...........	**5**	**2**	No norms	**95**
6.......	Country......	13	3	1	95
	City...........	**24**	**2**	**2**	**151**
7.......	Country.......	25	6	4	59
	City...........	**35**	**3**	**0**	**113**
8.......	Country......	18	13	5	74
	City...........	**44**	**19**	**4**	**116**
Total..	Country.......	84	22	10	422
	City...........	**128**	**26**	**6**	**576**
Per cent of whole	Country.......	20	7.2	4.4	
	City...........	**22.2**	**5.5**	**1.6**	

2. What is perhaps more significant still is the fact that there were 26 children in the Bloomington schools accelerated one or more years in their school standing whose intelligence scores were below the median score for what would have been their normal grade. The indication is that these children have been pushed ahead by ambitious parents and teachers faster than they should go. It might be argued that no child should be taken out of the group of children of his own age, and pushed ahead, unless he shows native ability at least up to the average of the grade to which he is advanced. The individual cases of all such pupils should, at least, be further investigated.

3. Some pupils accelerated in their school standing one to three years got scores which placed them in the lowest 10 percentile group for their grade. This in general means that they got scores lower than

the median for the second grade below the one in which they were placed. Every grade in the city and country schools had pupils whose intelligence score placed them in the lowest 10 or 20 percentile group of their grade, who, notwithstanding, had been advanced by the school one or more grades beyond the normal grade for their age. In fact our results show that 20 per cent of all children whose intelligence scores place them in the lowest 20 percentile group for their grade had been accelerated in their school standing one or more years. (Compare Table XII above.) There are cases where such intelligence score places pupils below the average score of the second grade below what would have been their normal grade. There can be little doubt but that most or all such pupils have been wrongly placed by the schools.

b. Reliability of Teachers' Estimates

That teachers can in general select the exceptionally bright and dull pupils in their schools is shown by the facts stated on page 115 ff. of this section of our report; that the average teacher, even with the aid of the school examination, cannot *accurately* select her brightest and dullest pupils is shown by the facts which immediately precede and by such facts as the following:

1. In a list of 74 pupils in the country schools who were rated by their teachers as their dullest pupils, 20 per cent got, upon individual Binet examination, an I.Q. of 90 to 110. That is to say, they possessed normal intelligence. There were 36.5 per cent who were feeble-minded; 30 per cent made an I.Q. of 70 to 80; 13.5 per cent made I.Q.'s between 80 and 90.
2. Of the children designated by the country teachers as their brightest pupils, 53 per cent proved to be normal, i.e. made I.Q.'s of 90-110; 20 per cent made I.Q.'s below 90. Only 20 per cent possessed superior intelligence, getting Intelligence Quotients of 110 to 120, and only 7 per cent showed very superior intelligence, getting an I.Q. over 120.
3. Two pupils tested in the Bloomington schools got intelligence quotients of 115 and 134 respectively. Both were ranked slightly dull by their teachers. They were advanced in their school standing two years and made group test scores falling at about the median for the grade in which they were placed, but above the median for pupils two years older.
4. Another pupil in a country school, classed as slightly dull by his teacher, got a group test score higher than *C* or average pupils four years older and higher than *C* and *C*+ pupils two grades above him. When individually tested by the Binet method he made an Intelligence Quotient of 134. He had been placed by the school one year ahead of his normal grade and so was not recognized as exceptionally bright by his teacher.
5. One Bloomington boy not on any teacher's list of bright or dull pupils ranked so high on the group tests that he was given an individual Binet examination and made an I.Q. of 140. No pupil on any teacher's bright list in the entire county showed such superior intelligence.

IV. GENERAL SUMMARY AND DISCUSSION OF RESULTS

Our study shows: 1. That schools differ widely in the pupil material with which teachers and superintendents have to deal and that the work of a school or teacher cannot be fairly judged without some knowledge of the mental ability of its pupil material.

2. That in any school great individual differences in native ability are to be found among its pupils and that for the sake of both school and the child it is essential that we at least locate the exceptionally bright and dull children and obtain some measure of their average deviation from the normal child.

3. That the schools of county X do not adequately take account of the variations in native ability found among their pupils. Our facts clearly show that there is need for a more accurate and practical method of measuring the mental ability of school children than teachers' estimates, school examinations, or any other method now in general use.

One question remains, which for this group is all-important, namely: Does the group of tests used in our mental survey give a reliable and practical method for determining variations in the mental ability of school children?

1. RELIABILITY OF OUR GROUP TEST SCALE

The fact that our tests did select and differentiate the children which the schools have found to be most capable or dull makes us believe that they provide a reliable method for selecting pupils with either *superior* or *inferior* mental ability. This belief is strengthened by such facts as the following:

1. All the pupils in the Indiana School for Feeble-Minded Youth, at Ft. Wayne, under 18, who could take the examination, 416 cases, made scores on our group tests which placed them in the lowest 10 percentile for their ages, our *E* or feeble-minded group.

2. Pupils known, by Binet ratings and by their work in special opportunity classes, to possess *very superior intelligence* were examined, and made scores which placed them in the upper 2 per cent of children of similar ages.

3. Individuals given our group tests and also examined by the Stanford Revision of the Binet Scale show that those with an I.Q. below 75 fall, when rated by their group test scores, in the lowest 10 percentile for their age; and, conversely, those whose Binet ratings classify them as possessing *superior* and *very superior* intelligence were readily selected by our group test scores as pupils with an *A* and *B* grade of intelligence.

4. Moreover, the tests have been given in two other Indiana cities with similar make-up of population. In these cities 1,778 school children took the tests and their age medians varied less than 2 points from each other and from the median scores for Bloomington.

We, therefore, feel that our group tests which can be given to 300 pupils at a time, and each paper scored by a stenographer in 2 or 3 minutes, give both a *reliable* and *practical* method for selecting pupils with *superior* and *very superior* or *inferior* and *very inferior* mental ability in any group of school children from grades 4 to 12 inclusive. They provide a reliable and practical method for obtaining the facts needed by teachers and school officials to enable them to adjust the schools and the work of instruction to the varying abilities of their pupil material.

A Primer scale is now being worked out in the Department of Philosophy which, we believe, can be made as reliable for the first, second, and third grades as the scale used in this study is reliable for grades 4 to 12. If this scale can be completed we shall have a practical and reliable scale for making a mental survey of any school community.

2. NEED FOR A MORE PRACTICAL METHOD OF MEASURING THE GENERAL INTELLIGENCE OF SCHOOL CHILDREN

I would not advocate any radical readjustment, or replacing of pupils in the school grades on the basis of group test scores alone. But I believe that the variations in native ability which appear in any fair-sized group of school children are too marked and important for the school system to neglect. I would not promote a child merely because he rated high on a group intelligence test or put him back a grade because he did poorly on such a test, but I believe that all the pupils retarded in their school standing, who made scores higher than the average score for the grade above what would be their normal grade and the pupils accelerated in their school standing one or more years who made scores below the median for the grade next below their normal grade, are worthy of immediate investigation; and I would like to see all children who made higher scores than the median score for the second grade above the one in which they were placed, double promoted and tried out in the grade where their mental ability indicates they belong.

A mental survey by means of a group scale of intelligence furnishes a practical and reliable method of finding out how well a school system is taking account of the mental differences in its pupil material and a very convenient and reliable method of locating the exceptionally bright and exceptionally dull children for individual examination and special treatment. The advantages of intelligence tests are many and obvious:

1. They help us to discover the children whose superior intelligence suggests their consideration for special promotion or advancement.

2. They help us make a prompt and reliable selection of those individuals who are so inferior mentally that they should be considered for special educational treatment.

3. Pupils with superior and very superior intelligence may be readily located and given an opportunity to advance as rapidly as their ability warrants. All such pupils should be specially helped as well as those that are mentally inferior, because one genius or pupil with very superior ability is worth more to the world and society than scores of men and women of inferior or average ability.

4. With the aid of reliable intelligence tests, the exceptionally bright pupils may be selected and placed in special classes and given an oppor-

tunity to advance as rapidly as they can go or be educated and trained in accordance with their native capacities. The mentally inferior individuals could also be located and isolated for special instruction, or if found necessary or desirable, classes of uniform mental strength might be formed and more uniform educational results obtained.

5. The intelligence score will also be of great value to teachers and superintendents in settling many cases of discipline. The selection and early recognition of the slow thinking pupils will throw much light on behavior which otherwise might be diagnosed as stubbornness, disobedience, or outright impudence.

6. Again, intelligence scores are the best single criterion for vocational guidance that we have. The results of intelligence testing in the army will soon reveal the level of intelligence which is required for success in all the more important professions and trades. Thousands of men are being given intelligence tests who belong to every important profession and trade. The efficiency of these men in their several occupations is being determined by reliable trade tests and by army service. In this way intelligence norms are being established for successful workers in all or most lines of work. Such intelligence norms will, therefore, tell a teacher or superintendent and parent what occupations or trades a given child should *not* take up as his life work, because with the aid of intelligence tests and the norms mentioned above, a superintendent or parent may determine whether a given pupil has or has not the native ability required for training and successful work in a given occupation. His chances for success in a given field may, therefore, be rather accurately predicted and the mental examination and score used in directing the education and occupational ambitions of the young people in our schools. We will soon know what in the way of general intelligence or native ability is required for success in every important occupation and profession. When these data will have been made available we will have the facts which will enable us to develop for society and the state every variety of talent and capacity found in our schools. No talents need to be wasted. Individuals with inferior intelligence can be educated for and led to do the things at which they can succeed. Individuals with superior mental ability may be located and given an opportunity to prepare themselves for the work which is in line with their mental capacity and interests, and the work of our schools can be made more economic and efficient because better adapted to the real needs and capacities of their pupil material.

V. AGE AND GRADE DISTRIBUTION TABLES

In order that other comparisons and relations than those indicated above may be worked out by those interested in the materials collected in this study, the total distributions by age and grade for both city and country children in county X are given below. In the tables given above the actual score made by each pupil was used in making all calculations. When the following tables are used the median and percentile scores must be calculated.

TABLE XVIII.—DISTRIBUTION OF SCORES OF BLOOMINGTON PUPILS BY AGE

SCORE	AGE										SCORE
	8	9	10	11	12	13	14	15	16	17	
195	...	...	...	...	...	...	...	...	...	...	195
190	...	...	...	...	...	...	...	...	...	...	190
185	...	...	...	...	...	...	...	...	...	...	185
180	...	...	...	...	...	...	...	...	...	...	180
175	...	...	...	...	...	2	...	...	...	...	175
170	...	...	...	...	...	...	...	...	...	...	170
165	...	...	...	...	2	...	...	...	...	...	165
160	...	...	...	...	2	1	1	...	...	...	160
155	...	...	...	...	2	2	3	...	...	...	155
150	...	...	...	2	3	3	4	1	...	...	150
145	...	...	2	4	7	4	1	3	...	...	145
140	...	...	...	8	7	6	5	2	...	...	140
135	...	1	3	5	6	6	7	2	...	...	135
130	...	...	1	10	4	11	7	4	...	...	130
125	...	2	3	5	7	13	6	...	...	1	125
120	...	1	5	4	10	11	6	2	...	1	120
115	...	3	6	9	12	7	5	4	2	...	115
110	1	1	6	5	10	7	11	4	...	...	110
105	...	3	4	6	5	7	5	1	1	...	105
100	1	2	7	8	10	4	5	3	1	...	100
95	...	2	8	5	8	2	1	1	...	...	95
90	3	6	5	5	7	5	3	1	...	...	90
85	3	4	3	5	2	1	1	...	...	...	85
80	2	10	3	4	3	1	...	1	...	...	80
75	2	3	7	2	1	...	2	...	...	...	75
70	6	13	7	5	3	3	2	...	...	1	70
65	11	6	3	7	1	...	...	...	...	...	65
60	5	7	4	2	1	...	...	...	...	...	60
55	4	5	4	2	...	...	1	...	...	...	55
50	4	9	2	...	1	...	...	...	...	...	50
45	3	5	1	1	1	...	1	...	...	...	45
40	2	2	2	3	1	1	...	...	...	...	40
35	3	3	3	2	1	...	...	...	...	...	35
30	1	1	3	1	...	...	...	...	...	...	30
25	...	3	1	...	1	...	...	...	...	...	25
20	2	2	...	...	...	...	...	...	...	...	20
15	...	...	...	1	...	...	...	...	...	...	15
10	1	1	...	...	...	...	...	...	...	...	10
5	...	...	1	2	...	...	1	...	...	...	5
0	...	...	...	...	...	...	...	...	...	...	0
Total No. pupils	54	95	94	113	118	97	78	29	4	3	
Median score	65.9	71.3	93.0	106.2	116.2	124.8	120.8	120.0	.....	.....	
10 percentile	37.2	39.1	43.0	58.2	81.3	93.7	89.0	.....	.....	.....	
90 percentile	89.7	107.5	124.6	141.7	148.0	152.9	150.0	.....	.....	.....	

TABLE XIX.—DISTRIBUTION OF SCORES OF COUNTRY PUPILS BY AGE

SCORE	AGE									SCORE
	8	9	10	11	12	13	14	15	16	
195..........	...	...	...	...	...	...	...	...	...	195
190..........	...	...	...	...	...	...	...	...	...	190
185..........	...	...	...	...	...	...	...	...	...	185
180..........	...	...	...	...	...	...	...	...	...	180
175..........	...	...	...	...	...	...	...	...	...	175
170..........	...	...	...	...	...	...	...	...	...	170
165..........	...	...	...	...	...	...	...	...	...	165
160..........	...	...	...	...	...	...	...	...	...	160
155..........	...	...	...	...	...	1	2	...	...	155
150..........	...	...	...	...	...	...	...	...	...	150
145..........	...	...	...	...	1	...	3	2	1	145
140..........	...	...	...	1	...	1	3	4	...	140
135..........	...	...	...	...	2	3	5	2	...	135
130..........	...	...	...	5	3	5	4	2	...	130
125..........	...	...	1	3	4	2	1	2	...	125
120..........	...	...	4	1	11	8	3	4	2	120
115..........	...	...	2	3	4	6	2	5	...	115
110..........	...	1	...	4	6	6	1	5	...	110
105..........	...	1	2	7	4	2	5	1	1	105
100..........	...	2	1	5	4	8	4	2	..	100
95..........	...	...	1	3	3	2	2	3	1	95
90..........	1	1	4	8	5	2	3	1	2	90
85..........	...	1	5	7	7	4	1	...	1	85
80..........	1	4	13	9	3	8	1	...	..	80
75..........	...	...	3	3	4	4	4	1	2	75
70..........	2	6	3	3	2	...	2	1	...	70
65..........	...	3	3	2	...	...	...	1	...	65
60..........	...	1	2	4	5	1	...	...	...	60
55..........	1	4	6	2	3	...	2	...	...	55
50..........	2	3	9	4	2	...	...	...	...	50
45..........	...	3	8	2	5	3	...	...	...	45
40..........	1	1	1	1	1	1	...	...	...	40
35..........	...	2	1	1	3	...	...	...	...	35
30..........	...	2	5	2	1	...	...	1	...	30
25..........	...	2	3	2	1	...	...	...	...	25
20..........	4	1	3	1	...	...	1	...	...	20
15..........	1	2	1	...	1	...	...	...	...	15
10..........	...	...	1	...	...	1	...	...	...	10
5..........	...	1	2	...	...	...	...	...	...	5
0..........	...	1	1	...	...	...	...	...	...	0
Total No. pupils.....	13	42	85	83	85	68	49	37	10	
Median score	51.2	58.7	63.7	88.9	94.5	105.	109.5	117.5	95.	

TABLE XX.—DISTRIBUTION OF SCORES OF BLOOMINGTON CHILDREN BY GRADE

SCORE	GRADE						SCORE
	3	4	5	6	7	8	
195	...	...	...	...	...	...	195
190	...	...	...	...	...	...	190
185	...	...	...	...	...	...	185
180	...	...	...	...	...	...	180
175	...	...	...	...	...	2	175
170	...	...	...	...	...	...	170
165	...	...	...	...	1	1	165
160	...	...	...	...	...	4	160
155	...	...	...	...	2	5	155
150	...	...	...	...	2	11	150
145	...	...	...	1	7	13	145
140	...	...	...	8	14	6	140
135	...	...	...	12	8	11	135
130	...	...	...	10	13	14	130
125	...	1	1	15	8	14	125
120	...	1	3	14	13	6	120
115	...	...	6	25	11	10	115
110	1	...	7	14	13	8	110
105	1	...	8	9	10	2	105
100	...	3	13	15	6	4	100
95	...	3	17	5	3	1	95
90	3	11	10	7	2	2	90
85	3	3	6	6	...	...	85
80	6	7	6	6	...	...	80
75	5	5	3	...	...	...	75
70	13	15	11	2	...	2	70
65	13	15	2	...	...	...	65
60	12	7	...	...	...	...	60
55	8	7	...	1	...	...	55
50	11	5	...	...	...	...	50
45	9	3	...	1	...	...	45
40	6	5	...	...	...	...	40
35	9	3	1	...	...	...	35
30	4	2	...	...	...	...	30
25	4	2	...	...	...	...	25
20	5	...	...	...	...	...	20
15	1	...	...	...	...	...	15
10	1	1	1	...	...	...	10
5	1	2	...	...	...	...	5
0	1	...	...	...	...	...	0
Total No. pupils	117	101	95	151	113	116	
Median score	59.1	69.5	97.2	116.9	124.4	133.2	

TABLE XXI.—DISTRIBUTION OF SCORES OF COUNTRY SCHOOL CHILDREN BY GRADE

SCORE	GRADE						SCORE
	3	4	5	6	7	8	
195	...	..	...	...	...	..	195
190	...	...	...	...	...	...	190
185	...	...	...	...	..	...	185
180	..	...	...	...	...	...	180
175	...	...	...	...	...	...	175
170	...	...	...	...	..	...	170
165	..	...	...	...	...	...	165
160	..	...	..	...	...	...	160
155	...	..	...	...	..	3	155
150	.	...	...	...	...	...	150
145	...	...	...	...	1	6	145
140	...	...	..	1	...	7	140
135	...	...	...	1	2	9	135
130	..	...	...	6	4	9	130
125	..	...	2	4	5	2	125
120	...	1	2	7	12	12	120
115	...	...	3	10	1	7	115
110	..	1	4	8	8	3	110
105	...	3	2	11	3	4	105
100	..	1	3	12	7	3	100
95	...	2	4	4	3	2	95
90	2	7	7	7	4	...	90
85	...	9	5	8	1	2	85
80	1	17	14	5	2	...	80
75	...	5	7	4	1	4	75
70	2	8	5	2	...	1	70
65	1	5	2	1	...	...	65
60	...	6	5	2	1	...	60
55	6	5	3	...	3	..	55
50	8	8	3	1	...	..	50
45	2	15	3	...	1	...	45
40	1	4	1	...	...	..	40
35	1	5	1	...	...	...	35
30	6	5	...	...	...	...	30
25	6	2	.	...	...	...	25
20	6	4	..	. .	...	...	20
15	5	1	...	..	...	...	15
10	...	2	...	...	...	...	10
5	1	2	...	1	..	..	5
0	2	...	. .	...	...	...	0
Total No. pupils	50	118	76	95	59	74	
Median score	34.1	65.	82.9	105.2	111.2.	124.6	

Appendix†

File ... **Schedule B**

INDIANA UNIVERSITY

Mental Survey—Case Study

Name.................... sex.......... Address....................
Parent or guardian..
Age............ born................. place.......................
Grade...... school......... city or town.............. state.........
Why studied ....
Diagnosis........................ based on......................

I. Physical condition

a*. present health stigmata
eyes ears build
b. disease history
c. development: prenatal birth age walking
talking puberty
d. characteristics of family: father
mother Siblings (ages)
other evidence as to heredity

II. Environment

a*. home conditions
(language spoken at home)
economic level, incomes and occupations
care taken of child
b. neighborhood

III. Social relationships and habits

a*. relations with other children
b. chief interests
c. vices
d. delinquencies
e. estimate of community

IV. School record

a*. school history:—handicaps: in other schools
began school absences (causes)
progress: retentions or double promotions (causes)
b*. teachers' estimates
scholarship
c. attitude and interest deportment

V. Mental Measurements

a*. scale rating: m.a. I.Q. Irregularity
b. other tests
c. make-up of examination
d*. coöperation, attitude and interest

Notes
Teacher......................... Physician..........................
Data secured from.............. Examiner...............date.......

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† Referred to in Dr. Pressey's paper, page 92.

* Only starred items need be covered in the first examination.

On Friday, at 1:30, a demonstration was given by Miss Hazel Hansford, of the department of psychology, and Dr. and Mrs. Pressey, of the use of the Stanford-Binet Scale. Miss Hansford examined a fifteen-year-old-girl, still in the fifth grade, to show the type of responses given by a subnormal child. Mrs. Pressey examined a nine-year-old child also in the fifth grade, to demonstrate what a bright child could do with the tests, and Dr. Pressey gave the tests to a small girl—six years old—to illustrate methods in examining very young children. Mrs. Pressey also gave a group scale of intelligence to thirty-five children selected at random from the sixth, seventh, and eighth grades. A facsimile of the blank used in this last examination, with the directions, is given below.

File..........   **Schedule D**

INDIANA UNIVERSITY

Mental Survey—Group Study

Name................ Age........ birthday........... grade........
Teacher........... School.......... place........... State..........
Date........ *Score*...... *Percentile*...... *M.A*........ *Irreg*........

I. Rote Memory.

1............
2............
3............
4............
5............
6............
7............
8............
9............
10............
11............
12............
13............
14............
15............
16............
17............
18............
19............
20............

II. Logical Selection.

DOG: ears, collar, nose.

Examples: BOOK: table, pages, shelf, printing.
CHAIR: arm, cushion, legs, rockers, seat.

1. CAT—fur, house, milk, claws.
2. TREE—apples, branches, acorns, roots, flowers.
3. SPELLING—book, writing, pencil, words, margin, letters.
4. SCHOOL—blackboard, teacher, window, pen, bell, school-house, pupils.
5. STORE—counter, clerk, cash register, advertisements, goods, boxes, stove.
6. BUILDING—windows, wood, chimney, wall, shingle, roof, stairs, shed.
7. DEBT—mortgage, creditor, money, lawyer, collector, debtor, bankruptcy.
8. SICKNESS—lameness, death, weakness, hospital, nurse, discomfort, doctor.
9. GOVERNMENT—capitol, consul, navy, freedom, King, senate, cannon, tax.
10. FRIENDSHIP—adoration, liking, lover, obedience, imitation, helpfulness, worship, girl.

III. Arithmetic.

1............
2............
3............
4............
5............
6............
7............
8............
9............
10............
11............
12............
13............
14............
15............
16............
17............
18............
19............
20............

IV. Opposites. Examples: poor—rich.
quick..........
hot..........

1. bad 1..............
2. short 2..............
3. little 3..............
4. black 4..............
5. high 5..............
6. light 6..............
7. day 7..............
8. thick 8..............
9. few 9..............
10. peace 10..............
11. from 11..............
12. top 12..............
13. apart 13..............
14. less 14..............
15. never 15..............
16. bless 16..............
17. country 17..............
18. past 18..............
19. motion 19..............
20. if 20..............

V. Logical Memory.

1............
2............
3............
4............
5............
6............
7............
8............
9............
10............
11............
12............
13............
14............
15............
16............
17............
18............
19............
20............

VI. Word Completion. Example: c..w.

1. c..t
2. b..by
3. tra..n
4. b..sket
5. b..n..na
6. tel..g..am
7. sw..at..r
8. eng..n..
9. a..it..me..ic
10. c..len..ar
11. a..t..mo..i..e
12. g..v..rn..e..t
13. p..tat..
14. d..cta..i..n
15. pa..ri..t..sm
16. org..ni..a..i..n
17. c..lu..n
18. t..a..h..r
19. f..e..d.. ..
20. s.. ..et..i..g

VII. Moral Classification. Examples: marking desks, giving, smoking, begging.

Whispering, stealing, charity, drunkenness, passing notes, kindness, sickness, gambling, tardiness, friendliness, extravagance, swindling, being noisy, benevolence, disobedience, forgery, justice, dissipation, graft, gluttony.

VIII. Dissected Sentences. Examples: See a I man.
knife the sharp is
cat dogs the after ran two

1. the cat see.
2. trees pine tall are.
3. boy was the sick.
4. I not do to like go school to.
5. me give my straw hat.
6. all know big boys how skate to.
7. their soldiers for fight country.
8. in the he brightest is boy class our.
9. teacher me gave a pencil my.
10. brother is my than I older.
11. asked me way I girl the to show the.
12. boy stone the who threw ran the fence the behind.
13. dash brother broke for my the yard fifty record the.
14. man whom the saw is you uncle my.
15. river the John to swim tried was straight but across carried down-stream.
16. the boy in is class only our old youngest ten years.
17. you me to direct office of will the principal the?
18. watch the man stole is jail who the in.
19. who the sing during birds so summer the flown the sweetly to have south.
20. boy gold who highest watch which beautiful prize jumps the get the will is a.

IX. Practical Information. Examples:

man **train**
cow **mule**
hen X **horse**
dog **bicycle**
cat **steamboat**

1.
water
wood
cork
sand
iron

2.
string
chalk
steel
glass
pencil

3.
milk
salt
bread
fish
meat

4.
drop the handkerchief
football
baseball
hide and seek
checkers

5.
Fourth of July
Washington's Birthday
Memorial Day
Thanksgiving Day
Labor Day

6.
scissors
chisel
plane
saw
knife

7.
policeman
sheriff
senator
mayor
representative

8.
bill
coins
check
draft
stamps

9.
smallpox
scarlet fever
measles
tuberculosis
diphtheria

10.
weaver
cabinet-maker
riveter
typesetter
coal-picker

X. Analogies.

girl—woman: boy—man
Examples: sun—day: moon............
good—bad: big............

1. woman—girl: man.......
2. kitten—cat: puppy.......
3. sky—blue: grass.........
4. fire—warm: snow........
5. winter—autumn: summer ....
6. horse—trot: fish.........
7. long—short: thick........
8. train—land: boat........
9. oyster—shell: banana.....
10. mother—daughter: father ....
11. hill—valley: high........
12. arm—elbow: leg.........
13. truth—falsehood: straight line..........
14. like—friend: hate........
15. teach—learn: teacher.....
16. known—unknown: past...
17. little—small: ancient.....
18. water—pipe: electricity...
19. age—youth: autumn......
20. failure—laziness: success ....

QUESTIONS

....
....
....
....
....
....
....
....

Directions to Pupils

All write your name, please, at the top of the page where it says "name", and your age where it says "age", then your birthday—month and day of the month—then your grade. On the second line write the name of your teacher where it says "teacher", then the name of the school (district, if country), place (city or township), and the state (Indiana). On the third line write the date (give date).

Now I am going to give you some tests. Please do your best, do your own work, and do *not* pay any attention to what those around you are doing.

I. Rote Memory.

Just below where you have been writing are twenty empty lines. Do you all see them? (Show place on blank.) I am going to read you some lists of words, so listen very carefully as I shall read each one but once. Do not write while I am reading; wait till I get through and then write the word I tell you to write.

1. This is the first list of words: *hat,* boy. Write on the first line the word that came after hat.
2. This is the second list: *mouse,* chair. Write on the second line the word that came after mouse.
3. This is the third list: cat, *baby,* cow. Write on the third line the word that came after baby, etc., for each line. (Repeat statement for each of the following lists.)
4. *paper,* watch, ink.
5. *horse,* stone, window.

This is the sixth list: Write the answer to this question on the sixth line.

6. ground, milk, *desk,* hand.
7. *lamp,* kitten, tree, girl.
8. ruler, *clock,* table, box.
9. *street,* glass, cloud, shelf.
10. spoon, print, red, *milk,* green.

This is the eleventh list: Write the answer to this question on the eleventh line.

11. chalk, *man,* bag, book, sister.
12. mother, chair, *think,* best, rain.
13. *run,* dark, hard, pen, flower.
14. ball, *shoes,* sleep, sick, bright.
15. light, past, *bed,* dog, match, coat.

This is the sixteenth list: Write the answer to this question on the sixteenth line.

16. swim, dull, plow, *sky,* ship, dress.
17. *ring,* foot, jump, snow, flat, child.
18. point, noise, *cook,* river, dead, long.
19. pencil, *quick,* house, hill, run, store.
20. grass, rain, *woman,* cloth, see, true, warm.

II. Logical Selection. (Time 3 minutes.)

Just below where you have been writing are some words in big letters. Each one is followed by a list of other words in small letters. Look at the examples: the first word in big letters is "dog." What two things in the list following is a dog never without? (Have class give answer)........Those two words are underlined. Look at the second example. What two things in the list following "book" is a book never without? (Class answers question)........Put a line under each of these words, just as there is a line under "ears" and under "nose" in the first example. Now look at the third example. What two things in the list following "chair" is a chair never without?........Put a line under each of these two words, just as you put a line under "pages" and under "printing" in the second example. Now hold up your pencils like this so you will all start together. In each of the ten lists, just below, put lines under the two words which the word in large letters, at the head of the list, is never without, exactly as you put lines under "pages" and "printing" and "legs" and "seat" in the two examples. And one thing more: do not underline more than *two* words in any list.

III. Arithmetic.

Just below where you have been working you will see a number of lines numbered from 1 to 20. On these lines I want you to write the answers to the questions I am going to read. Do the questions *in your head.* If you miss an answer leave the line blank.

1. On the first line write the answer to this question: If you had 5 eggs, and broke two, how many would you have left?

2. On the second line write the answer to this question: If you had 10 apples, and gave 1 to your mother and 1 to your father, how many would you have left?

3. If you had 25 marbles and lost 4, how many would you have left?

4. If you had 25 sticks of candy, and you gave 5 to your sister and 6 to your brother, how many would you have left?

5. If you had 25 rabbits, and 4 of them were killed and 8 more ran away, how many would be left?

On the sixth line write the answer to this question:

6. If you had 25c and bought 5 papers at 2c each, how much would you have left?

7. If you had 15c and bought three blocks of paper at 3c each, how much would you have left?

8. If you had 25c and you bought two handkerchiefs at 10c each, and a pad of paper at 3c, how much would you have left?

9. If you had 25c, and you bought 2 erasers at 3c each and a bottle of ink at 5c, how much would you have left?

10. If you had 50c, and bought a half dozen eggs at 60c a dozen, how much would you have left?

On the eleventh line write the answer to this question:

11. If your father gave you 30c, and your mother gave you ½ as much, and you spent a third of what you had in all, how much would you spend?

12. If you could walk a mile in 20 minutes, how many miles could you walk in 2 hours and a half?

13. If you spent 5c a day for a week, and then spent twice as much each day of the next week, how much would you spend in all?

14. If you had 30 books, and you gave away one-third of them and then lost 3, how many would you have left?

15. If you rode 5 miles and a half in a taxi cab, at 50c a mile, how much money would you spend?

On the sixteenth line write the answer to this question:

16. If you had a dollar, and you went down town spending 5c on the way down, and twice as much on the way back, and bought 2c stamps for twelve letters while you were there, how much would you have left?

17. If you bought 3½ lb. of sugar at 10c a lb., and a gallon of milk at 12c a qt., how much would you have spent?

18. If you could copy a list of 100 words in 5 minutes, how many words could you copy if you worked 40 minutes a day for 4 days?

19. If you had 50c and you bought 5 pints of milk at 12c a qt., a half lb. of candy at 10c a lb. and a loaf of bread at 9c, how much would you have left?

20. Suppose your family has to have 5 loaves of bread each week. If bread should go up from 7c to 10c a loaf how much less butter, at 30c a lb. would you have to use, and still pay the same for butter and bread?

IV. Opposites. (Time 3 minutes.)

Turn over the page; at the top of the page there is a list of 20 words, with a blank line at the side of each one. Look at the first example, the word is "poor." What is the opposite of "poor;" if you are not poor, what are you? (Have the class answer)........Look at the second example, the word is "quick." If you are not quick what are you? (Class answers question)........Write the word "slow" on the line beside "quick," because slow is the opposite of quick. Look at the third example, the word is "hot." What is the opposite of hot? (Class answers question)........Write the word "cold" on the line beside "hot," because cold is the opposite of hot. Now write the opposites of all the other words in this list on the lines beside them. On the line numbered 1 write the opposite of "bad," on the line numbered 2 write the opposite of short, and so on for the twenty words. If you come to one you do not know, skip it and go on.

V. Logical Memory.

This time, put your pencils down. I am going to read you a newspaper article and I want you to listen very carefully, for I shall read it only once and then shall ask you several questions about it. You are to write the answers to the questions on the twenty empty lines just below where you have been working. This is the article:

"East Chicago, January 17. A fire on Washington Street, early this morning, destroyed Smith's grocery store, a barn and two dwelling houses near. The loss was about $12,000 and was partly covered by insurance. Six gallons of kerosene in the rear of the store burned fiercely, and made the fire hard to put out, because throwing on water only spread the flames. Mr. Smith lived over the store with his wife, two sons, and a daughter. The youngest, Mary, five years old, was made unconscious by the smoke and was rescued by a neighbor with some difficulty. The younger son, Harry, seven years old, helped his father in removing some of the goods from the burning store. Sparks, carried by a strong west wind, spread the fire to the adjoining buildings. Some think the fire was accidental, but the cash drawer was found open and empty, so the fire was probably set to conceal a robbery."

Now answer these questions with just one word—yes or no, or a name or a number. Write the answer to this question on the first line:

1. Were the buildings insured?
2. Was the oldest child overcome by smoke?
3. Was she rescued by her father?
4. How many children were there in all?
5. Was Harry five or ten years old?

Write the answer to this question on the sixth line:

6. How many dwelling houses were burned?
7. Was the kerosene the cause of the fire?
8. How many gallons of kerosene were there?
9. Was the wind blowing from the north?
10. What was the youngest child's name?

Write the answer to this question on the eleventh line:

11. Did Mr. Smith live in one of the adjoining houses?
12. Was the fire in the summer time?
13. Was Mrs. Smith badly burned?
14. On what street was the store?
15. On what day of the month did the fire take place?

Write the answer to this question on the sixteenth line:

16. Did the fire burn three or five buildings?
17. How great was the loss?
18. What part of Chicago was the fire in?
19. How much money was found in the cash drawer?
20. Did the fire burn down a drug store?

VI. Word Completion. (Time 3 minutes.)

At the bottom of the page you will see a list of words: wherever you see a line in these twenty words it means that a letter has been left out. And I want you to fill in these letters. Now all start.

VII. Moral Classification. (Time 1 minute for each group.)

At the very top of the next page you will see three lines of words; look at the examples. They read "marking desks, giving, smoking, begging." Do you all see them? What words of the examples mean something which you must not do in the school-room? (If "smoking" is given by the class say: "Why, you wouldn't be likely to smoke *in* the school-room anyhow, would you?") That word has a number "1" under it. What word in the example means being good to other people? (Class answers)........Put a number "2" under that, in the same way that there is a number 1 under "marking desks" in the first example. What word in the example means something that will hurt yourself? (Class answers)........Put a number "3" under that. What word in the example means getting something unfairly from some one else? (Class answers)........Put a number "4" under that. Now pencils up.

1. Go through the list (it begins with "whispering") and put a number "1" under each word which means something that it is wrong to do in the school-room, in just the way that there is a number "1" under "marking desks" in the example.

2. Pencils up. Now go through the list again and put a number "2" under every word which means being good to other people, in just the way that you put a number "2" under "giving" in the example. And one thing more, do *not* put more than one number under any word.

3. Pencils up. Now go through the list a third time and put a number "3" under every word which means something which hurts yourself, is bad for yourself, just as you put a number "3" under "smoking" in the example. And again, do *not* put more than one number under any word.

4. Pencils up. Now go through the list a fourth time and put a number "4" under each word which means getting something unfairly from some one else, in just the same way that you put a number "4" under "begging" in the example. And once more, do *not* put more than one number under any word.

VIII. Dissected Sentences. (Time 5 minutes.)

Now pencils up—all stop. Look at the examples just below where you have been working. The first example is "See a I man." That does not make sense, does it?........How should it read? (Class answers) ....What *should* be the first word? (Class answers)........That has a line under it. What *should* be the last word? (Class answers) ....That has two lines under it. Look at the second example. How should it read? (Class answers)........What should be the first word? (Class answers)........Put a line under it in just the way that there is a line under "I" in the first example. What should be the last word? Put two lines under that in just the way that there are two lines under "man" in the first example. Now look at the third example; what ought to be the first word if the sentence is to make sense? (Class answers) ....Put a line under it. What ought to be the last word if the sentence is to mean anything? (Class answers)........Put two lines under that. You see the sentence should read "Two dogs ran after the cat." Now go through the 20 sentences just below and in each one put one line under what should be the first word, and two lines under what should be the last word, if the sentence is to make sense, just as you put lines under "the" and "sharp," and "two" and "cat," in the examples.

IX. Practical Information.

Turn over the page. At the top are two examples. The first one reads "man, cow, hen, dog, cat." Of those five animals, which one usually lives the longest? (Class answers)........That has a line *under* it. Which one usually lives the shortest time? (Class answers)........ That has a cross *after* it. Now look at the second example, "train, mule, horse, bicycle, steamboat." Of those five, which goes fastest? (Class answers)........Put a line under it, in just the way that there is a line under "man" in the first example. Which goes slowest? (Class answers)........Put a cross after it, in just the way that there is a cross after "hen" in the first example.

Now look at the list numbered 1. Put a line under the thing that is heaviest, and a cross after the thing that is lightest.

Look at list number 2. Put a line under the thing it is hardest to break, and a cross after the thing it is easiest to break.

Look at list number 3. Put a line under the thing that costs most, and a cross after the thing that costs least.

Look at list 4. Put a line under the game that it takes most people to play, and a cross after the game that it takes fewest people to play.

Look at list 5. Put a line under the holiday that comes nearest New Year's and a cross after the holiday that comes nearest the middle of the year.

Look at list 6. Put a line under the tool that is hardest to sharpen, and a cross after the tool that is easiest to sharpen.

Next look at list 7. Put a line under the most important man and a cross after the least important man.

Next look at list 8. Put a line under the safest way to send money, and a cross after the least safe way.

Now list 9. Put a line under the disease that it takes longest to get well from and a cross after the disease one recovers from quickest.

Now the last list. Put a line under the man who must have most skill, and a cross after the least skilled worker.

X. Analogies. (Time 3 minutes.)

Now the last test of all. The first example reads: girl—woman: boy—man. When a girl grows up, she is a woman: when a boy grows up, what is he? (Class answers)........So "man" should be the fourth word for it finishes the meaning of the other three words. Look at the second example. It reads sun—day: moon—........The sun shines during the day, and the moon—when? (Class answers)........So "night" is the right word for it finishes the meaning of the other three words. All write "night" on the line after "moon." Now look at the third example. It reads, good—bad: big—........There is good and bad and big and ....? (Class answers.) So what word should be written after "big?" All of you write "little" (or "small") after "big." Now go through all the other twenty lists in just this way, writing on the line after each list the word you need to finish the meaning of the other three. If you come to a list you can't do, skip it and go on.

PUBLICATIONS OF THE BUREAU OF COÖPERATIVE RESEARCH

Requests for these publications should be addressed to the Bureau of Coöperative Research.

REPORTS OF CONFERENCES ON EDUCATIONAL MEASUREMENTS

Proceedings of a Conference on Educational Measurements, April 17-18, 1914. Vol. XII, No. 10, Indiana University *Bulletin*. (Out of print.)

Second Annual Conference on Educational Measurements, April 16-17, 1915. Vol. XIII, No. 11, Indiana University *Bulletin*. Price, 50 cents.

Third Conference on Educational Measurements, April 14-15, 1916. Vol. II, No. 6, *Bulletin of the Extension Division*, Indiana University. Price, 50 cents.

Fourth Conference on Educational Measurements, April 20-21, 1917. Vol. III, No. 8, *Bulletin of the Extension Division*, Indiana University. Price, 50 cents.

Fifth Conference on Educational Measurements, April 19-20, 1918. Price, 50 cents.

STUDIES IN EDUCATIONAL RESEARCH

Arithmetic: A Coöperative Study in Educational Measurements. By M. E. Haggerty. Vol. XII, No. 18, Indiana University *Bulletin*, Indiana University *Studies* No. 27. Price, 50 cents.

Studies in Arithmetic. Edited by M. E. Haggerty. Vol. III, No. 32, Indiana University *Studies*. Price, 25 cents.

The Ability to Read: Its Measurement and Some Factors Conditioning It. By M. E. Haggerty. Vol. IV, No. 34, Indiana University *Studies*. Price, 25 cents.

A Coöperative Study of Reading in Sixteen Cities of Indiana. By Bureau of Coöperative Research. Vol. V, No. 37, Indiana University *Studies*. Price, 35 cents.

Studies in Arithmetic, 1916-17. Edited by Walter S. Monroe. Indiana University *Studies* No. 38. Price, 35 cents.

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BULLETIN OF THE EXTENSION
DIVISION, INDIANA UNIVERSITY

VOL. V BLOOMINGTON, IND. No. 1

Sixth
Conference on Educational Measurements

SEPTEMBER, 1919

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[illegible] University, [illegible]

SIXTH ANNUAL CONFERENCE

ON

EDUCATIONAL MEASUREMENTS

Held at Indiana University, Bloomington, Ind.,
Friday and Saturday, April 18 and 19, 1919

PUBLISHED BY
THE EXTENSION DIVISION OF INDIANA UNIVERSITY
1919

Jan. 8, 1920

Gift of Prof. Haines

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Introductory Statement

THE Sixth Annual Conference on Educational Measurements was held under the auspices of the School of Education at Indiana University, Friday and Saturday, April 18 and 19, 1919. The attendance of superintendents and teachers was very good, and unusual interest was indicated in all sessions of the Conference. This Conference is held annually by the School of Education as one means for bringing to the attention of superintendents and teachers of the state significant matters relating to educational progress. It is gratifying to the School of Education that it is evident that the school men of the state have come to look upon this Conference as one of the most important educational gatherings of the year.

The program of the sessions is given below. This year no stenographic record was obtained of the Conference, and the published proceedings include only the manuscripts submitted by the speakers on the program. In a few cases no manuscript was submitted because conditions unforeseen at the time the program was published made impossible a satisfactory report.

FRIDAY, APRIL 18, 1919

Morning Session, 10:45 a.m.

Presiding, Linnaeus N. Hines, State Superintendent of Public Instruction, Indianapolis.

10:45. Opening Address: William Lowe Bryan, President of Indiana University.

11:00–11:45. Address: Diagnosis of Language Errors. W. W. Charters, Dean of the School of Education, University of Illinois.

11:45–11:55. Report: The Progress and Promotion of Pupils in Certain Indiana Cities. Walter S. Monroe, Director of the Bureau of Coöperative Research, Indiana University.

Afternoon Session, 1:15 p.m.

Presiding, Walter S. Monroe.

1:15. Demonstration of the Use of Group Tests for Intelligence. Sidney L. Pressey, Research Assistant in Psychology, Indiana University.

2:15–4:00. Mental Measurements in the Army and Public Schools.

1. Brief Reports on Results of Group Testing in the Army and in Indiana Public Schools. William F. Book, Professor of Educational Psychology, Indiana University; Oscar H. Williams, State High School In-

spector, Indianapolis; Rudolph A. Acher, Department of Psychology, State Normal School; Emery W. Montgomery, Superintendent of Public Schools, Bedford; A. H. Douglas, Superintendent of Schools, Logansport; Earl E. Ramsey, Superintendent of Schools, Bloomington.

2. Mental Defectives in the Rural Schools of County H. in Relation to their Physical Environment. Hazel Hansford, Research Fellow in Psychology and Sociology, Indiana University.
3. A Group Scale of Intelligence for the First and Second Grades. Mrs. Sidney L. Pressey, Graduate Student, Department of Philosophy, Indiana University.
4. School Surveys by means of Group Tests of Intelligence. Sidney L. Pressey.

4:00–4:45. Address: Educational Service in Iowa. Ernest J. Ashbaugh, Director of Educational Service of the Extension Division, University of Iowa.

Evening Session, 8:15 p.m.

Presiding, Acting Dean William W. Black, School of Education, Indiana University.

Address: Scientific Curriculum Construction, W. W. Charters.

Address: Next Steps in Educational Measurements. Walter S. Monroe.

SATURDAY, APRIL 19, 1919

Morning Session, 9 a.m.

Presiding, Earl E. Ramsey, Superintendent of Schools, Bloomington.

9:00–9:45. Report: Some Recent Developments in Spelling. Ernest J. Ashbaugh.

9:55–10:40. Report: Some Experiments with Mental Tests as an Aid in the Selection and Placement of Clerical Workers in a large Factory. Chester S. Carney, Consultant with Scovell, Wellington, and Company, Industrial Engineers, Boston, Mass.
Discussion.

10:50–11:30. Round Table Discussion: Educational Diagnosis and Corrective Instruction. W. W. Charters.

11:30–11:50. Presentation of the Plans of the Bureau of Coöperative Research. Walter S. Monroe.

Afternoon Session, 1:30 p.m.

Presiding, Hubert G. Childs, Professor of Education, Indiana University.

1:30–2:15. Diagnosis of Grammatical Errors. W. W. Charters.

2:20–3:00. Report: Pupils' Errors in Arithmetic. Walter S. Monroe.
Discussion.

The keynote of the meeting was a plea for diagnosis and more complete interpretation of educational measurements in order that the use of educational tests may result in the greatest possible improvement of instruction. This topic was emphasized by Dean Charters of the University of Illinois in two addresses and was mentioned incidentally a number of other times. It is clearly a next step. It is practically impossible to justify the use of educational tests unless it results in improving instruction. Up to the present time we have been primarily concerned with getting acquainted with educational tests and learning how to use them to measure the ability of pupils. We are now ready to take up the use of the results of the tests in improving instruction.

A very pleasing and satisfying event which is not listed upon the program was the Teachers' Dinner held at the University Commons on Friday evening at 6:30. Acting Dean Black of the School of Education presided at a brief program of after-dinner speaking in which technical matters relating to education were almost entirely eliminated.

WALTER S. MONROE,
Director, Bureau of Coöperative Research, Indiana University.

Diagnosis of Language Errors

W. W. CHARTERS, Dean of the School of Education, University of Illinois, Urbana, Ill.

THERE is a common feeling that attention to errors and to defects in language produces average ability to write and speak, but does not promote artistic speech. It is commonly felt that this attention to errors brings the individual student up to the average level but does not incite him to superior ability.

This opinion is incorrect. It presupposes that the standard in diagnosis of errors is the average, and it takes no more than a mere mention of the fact to make it clear that the standards can just as well be those of the writings of Stevenson, Shakespeare, or Lincoln, and that deficiencies may be gauged by the best as well as any other standards including the average. Diagnosis is not concerned merely with errors such as *I seen,* and *It ain't,* but it is also concerned with the superiority of *Half a league, half a league, half a league onward,* over the mathematically accurate and shorter *A league and a half onward.* While it seeks to correct *He don't,* it notes with equal clearness the inferiority of *She is a peach,* to *She walks in beauty like the night of cloudless climes and starry skies.*

There is, to be sure, a literary spontaneity which of its own accord rises to different heights of excellence, partly by virtue of native talent and partly by undirected study. Sometimes this rises to spectacular levels as in the case of Burns but usually it is on the plane of the average. The great mass of school children, however, will, at best, do well if they speak correctly, and only a small number may hope to attain to brilliance of expression.

But the brilliant and the average alike can be improved by attention to their deficiencies. If standards are set on the lower level of correct speech, artistry will suffer, but if the standards established by the masters is set, artistry will be developed in those capable of attaining unusual facility of expression. Diagnosis of difficulties is the most satisfactory method of improvement for both the average and the brilliant student.

Presumably a teacher can read the oral and written language of children appreciatively and may thereby look for excellent expression and ignore mediocrity. He may stress the fine and striking words and phrases and this has its advantages in helping students to be original and brilliant. But he can also look for deficiencies and errors, note where language falls below a standard, and direct the writer to correct and improve. Instead of taking as his motto the idea, "This is fine", he may substitute, "This is wrong and can be improved." It is obvious that both of these can be used, but improvement is more dependent upon the notice of deficiencies than upon the notice of accomplished excellencies. An experienced writer asks the criticism of an experienced critic in order to obtain some evaluation of good and bad, but particularly in order to be made aware of the bad. However, children more than adults need to have both excellence and defects pointed out because they lack confidence in their own powers and they become discouraged if only the defects are noticed.

The foregoing is stated merely for the purpose of reinforcing what was said above to the effect that while attention to excellence is valuable, improvement depends primarily upon attention to deficiencies.

It is obvious that standards are necessary bases for diagnosis. The rejects of the army could not have been determined without reference to military standards. The presence of flat feet was discovered only after the proportions of a perfect foot had been obtained, and undernourished bodies were determined only after the standards for a well-nourished body were known. An error in language is noticeable only when correct forms have been ascertained, and deficiencies in artistic language which is grammatically correct are apparent only to those who have standards of rhetorical excellence.

In the determination of standards in language some slight progress has been made in the scales of Hillegas, Ballou, and Willing, and in the Nassau County Supplement. These assume a standard of both rhetorical and grammatical excellence which is not confined to average performance. The method of determining which composition is good and which better is that of comparing one composition with another. These compositions were written by children, and theoretically the more carefully prepared of these scales begins with zero ability in composition, and on this basis by the method of equally observed differences, compositions are selected which are one unit, two units, etc., better than zero. It is evident, of course, that this method could have been continued by the inclusion of other compositions until Stevenson and Lincoln were rated in comparison with children's compositions and with zero ability in writing. The fact that the Hillegas scale has only ten steps between zero and the best is due entirely to the fact that the selection of his compositions limited him to that range. The inclusion of compositions superior to those he had would have made it possible to continue the process of adding steps like those of the ladder of the patriarch, Jacob, until the literary heaven of the great masters is reached.

But these composition scales just mentioned are not useful for diagnostic purposes. The reason for this is that, in general, they are based upon standards which are unanalyzed. For instance, Hillegas had his graders rate the compositions merely as better and poorer than each other and without regard to any standards other than those the graders had in their own minds. And these were very general standards even tho some graders laid great emphasis upon punctuation, others undue emphasis upon grammar, and still others valued artistic expression very highly. Even tho Ballou improved on this analysis by dividing the compositions into the four major divisions of narration, description, exposition, and argumentation, and Willing into the content and form, the same criticism holds. The scales are the result of the application of unanalyzed standards and are not, therefore, particularly useful for diagnostic purposes.

It should be interpolated at this point that a diagnostic test must be able to reveal specific difficulties since improvement is obtained by first establishing a standard and then locating the specific points at which the standard is not attained. For instance, the army has done its superficial duty when it merely rejects an applicant, but if this reject is turned over to an improvement agency it is necessary to do more than reaffirm the rejection of the army officials or to advise the reject to improve his health. A diagnosis for purposes of improvement must be much more detailed and must be carried on until the reject is found to have defective teeth, flat feet, a curved spine, or weak eyes. Only when physical diagnosis has been carried to this point is it useful for improvement, and in improvement of speech ability the same process holds. It is not sufficient to rate compositions, and, after affirming a grade to be 184, to return it to the pupil with the admonition to bring it up to 300 on the next attempt. Rather, the pupil must find in his returns specific points at which improvement is necessary. Once these have been determined, corrective methods may be introduced, but not until then, because improvement in reaching a standard is specific and not general. General improvement is in reality the sum of detailed improvements and is not independent of them.

To improve the Hillegas scale for diagnostic purposes it is necessary to analyze composition writing into its elements and obtain a scale for each.

It is a confession of the pioneer that in attempts to obtain diagnostic tests as opposed to general ability tests the only tests yet made have to do with correctness rather than with artistic excellence. A beginning had to be made somewhere, and it is easier to set up standards of accuracy than of artistic and rhetorical excellence.

Starch has made one such attempt in his punctuation scale. A series of unpunctuated sentences has been prepared and the pupils are requested to punctuate them correctly. This enables the teacher to determine not only which punctuation marks each pupil fails to use but also which errors are common to the greatest number of pupils and, therefore, need the greatest amount of immediate attention. It also determines the relative efficiency of classes and of individuals in each class.

The other attempt of a similar nature is that of the writer in a pronoun scale recently issued in preliminary form. At present several thousand copies of this scale have been printed and used and standards of performance are now being established and will soon be published.

For our purposes a brief description of the methods of determining the elements will be sufficient.

The purpose of the scale is frankly that of determining how far the pupils deviate from accuracy of grammatical form. No attempt is made to determine rhetorical or artistic ability.

The scale is a by-product of studies made in tabulating the grammatical errors of school children, principally in Kansas City and Detroit, but with verifying studies in other states, studies of sufficient extensity to show that the types of grammatical errors are common to all parts of the nation and that the differences in speech between one section and another are largely differences of vocabulary, pronunciation, enunciation, and non-grammatical idioms rather than differences in grammar.

In all, some twenty-five thousand oral errors were tabulated and classified. Fortunately, it was found that these twenty-five thousand cases could be classified under twenty-one heads. For instance, it was found in Detroit that fourteen subheads under the twenty-one rules comprised 6,500 of the 11,200 errors, or nearly 60 per cent of the cases. These were, in order of frequency: *ain't got, give* for *gave, was* for *were, seen* for *saw, can* for *may, ain't* for *isn't* and *aren't, done* for *did, John he, is* for *are, don't no* (double negative), *them* for *these* and *those, me* and *Catherine did, come* for *came,* and *don't* for *doesn't.*

In this collection of errors all types were included and it was a simple matter to make selections of errors and to present them to pupils. The collection provided further for the making of equivalent forms of the same test so that children can be tested out a second time with similar material upon identical points.

I have distributed the language scale[1] among you and an examination will show two items of importance. The first is the value attributed to each sentence. These were determined by the usual method of finding among 3,500 children how many failed to write them correctly and of rating these in terms of sigma of the normal probability curve. This means that on the basis of difficulty an item with "3" suffixed is three times as difficult as one with "1", and one and one-half times as difficult as one with "2" after it. This is not exactly accurate, as, obviously, the decimal has been dropped and the nearest integer substituted. Furthermore, in our next form of the scale we shall drop the weights and give them all equal value because we have found that the correlation between scores determined, on the one hand, by adding weighted suffixes, and, on the other hand, by giving a value of one to each sentence, is 97, which is so large as to make the extra labor of weighting unnecessary.

The second point is the method of examination. It is to be noted that the preliminary statement says, "Some of these sentences are right and some are wrong." This is significant because the child approaches each sentence in the natural way. By this I mean that he has no more hint as to which sentence is right and which is wrong than he has when he prepares to use the sentence in practical speech. This is an improvement over the plan of having him choose alternative forms, as in (Who, Whom) dc you see? where he has the two forms before him in parentheses and is asked to cross out the wrong form. Our plan is better because the presence of *who* and *whom* makes him more alert mentally than he would be if the sentence were given him with an innocent-appearing error quietly lodged within it. The labor of writing is greater and the task of marking is somewhat longer, but the returns constitute a much more accurate description of what children actually do.

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[1] A portion of this language scale is reproduced herewith. The remaining items of the scale may be obtained by referring to the Diagnostic Language and Grammar Test reproduced on pp. 16-22. The distinction between this test and the one reproduced here is that it has spaces added for giving the grammatical reason for the correction. The type of this test as well as the other test reproduced in this volume has been reduced somewhat in size in order to facilitate the reproduction.

Pupil's Score

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UNIVERSITY OF ILLINOIS

Urbana, Illinois

BUREAU OF EDUCATIONAL RESEARCH

DIAGNOSTIC LANGUAGE TEST

PRONOUNS

By W. W. Charters

Grades III to VIII

Post Office..County........................State....................Date...........

School....................................Pupil's Name..Age..........Grade.. ...

DIRECTIONS FOR GIVING THE TEST

After telling the children not to read the papers, ask those on the front seats to distribute the papers, placing one upon the desk of each pupil in the class. Have each pupil fill in the blanks at the top. Then read the following instructions with the pupils.

Instructions to be read by teacher and pupils together

"This test is given to pupils who have studied language lessons to see how well they are able to tell when sentences are right and when they are wrong. In these pages will be found exercises like the following:

1. I told him to go

....

"The plan is to read this sentence over carefully and see if it is correct. If it is correct copy the sentence exactly on the dotted line below the sentence. The sentence, *I told him to go*, is correct so we shall write it on the dotted line below. We shall now write this sentence in." (The teacher should pause to allow time for doing this).

"If the sentence is not correct we are to write the correct form on the dotted line below. Let us try one that is not correct."

2. I told she to go.

....

"The correct form is *I told her to go*. So we shall write *I told her to go* on the line below." (The teacher should pause to allow time for doing this.)

"When you have copied all the sentences on the first page you will stop work."

The teacher should pass around the room and see that all the children fill the above forms correctly and when all have finished he should say, "Begin work on the first page below." This is not a speed test so ample time should be allowed for each to finish. The test should be completed in two periods taking the first page in the first period. Collect a pupil's paper as soon as he has finished. At the second period have the papers distributed giving to each pupil his paper. As at the first period tell them not to read the papers until told to do so and re-read the instructions with them.

	Value		Value
1. John went to town.	1	7. Who do you want?	2
....	....	....	....
2. May Inez and me go?	1	8. Him and I will do it.	2
....	....	....	....
3 It teaches a person something you may use.	3	9. Us boys did it.	2
....	....	....	....
4. Yous girls plays too hard.	1	10. The boy was raised by its own mother.	2
....	....	....	....
5. When one lives in town they hear noises.	3	11. These books are yourn.	1
....	....	....	....
6. That is hern.	2	12. It was a book with riddles in them.	1
....	....	....	....

I may say, parenthetically, that to avoid the labor of writing we are now experimenting with directions to see if we cannot have the pupil merely write, on the line below, the correct form of the incorrect word in the sentence above, and neglect the other words.

It is obvious that no time limit can be set for such an exercise since speed in writing would be a determining factor of large influence. On the other hand, in so far as the test is diagnostic, the teacher is more concerned in finding what the pupil can do with these errors when he is given the opportunity to attack each than he is in seeing how many he can do in a given period.

A final word needs to be said as to the use of these tests in diagnosis.

This language test gives examples of all types of errors which were found in pronouns. When a test has been given, the teacher has before him a fairly complete analysis of the pupils' ability to recognize the correct forms. It should be pointed out, of course, that such would not be the case in errors in verbs because while we can mathematically determine all possible errors in pronouns, since there are such a small number of them, it would be an almost impossible task to determine all verbs in which errors might presumably be made. But in either case, if frequency is made the basis of selection, a fairly complete list of those errors which the class make can be determined.

Once these errors have been ascertained it is then possible to find out the errors which are most frequent in the class as a whole and thereby it is quite easy to arrange to lay particular stress upon the correction of the most common ones. Of equal importance is the fact that the teacher and each pupil may become aware of the special difficulties of each pupil and thereby incite him to work harder in correcting his difficulties.

If, however, the study stops at this point, little has been accomplished. In other words, as time goes on it is necessary to tie up with the diagnosed difficulties the corrective measures and these are of at least three sorts. In the first place, language games can be given to fix the correct forms in the minds of the children. Many of these games are available in certain books prepared for that purpose and other games are in current use among teachers. In the second place, language exercises such as those found in blanks, alternative forms, etc., are excellent. And, in the third place, eternal vigilance in correcting every mistake whenever it occurs is an absolute essential. And underlying all of these must lie the desire within the pupil to correct his speech. The absence of this desire is the most difficult situation that has to be faced and it would be well some day for a diagnostic test to be made to determine the amount of desire and the points at which the desire is not present.

In general, then, the situation with regard to diagnosis of linguistic errors is this: Some standard tests of a general sort have been made which have little diagnostic value. The only attempts to obtain diagnostic tests have to do with correctness and have nothing to do with rhetorical excellence other than that which resides in, or comes from, accuracy of statement, but it is comparatively easy to prepare such diagnostic tests by an analysis of the elements of artistic excellence and this, it is to be hoped, will be the next line of study which will be taken up by those interested in the subject.

Diagnosis of Grammatical Errors

W. W. CHARTERS

THE primary function of grammar is that of analyzing the sentence into its elements and showing the relation of each element to the other. This analysis reveals the seven parts of speech and their declension forms, phrases and clauses, and the syntactical relations such as agreement and modification.

While the function of grammar is thus freely acknowledged by all, the function of its study in the grades has not been so universally agreed upon. Historically, its study has been justified for many years upon the basis either of knowledge for its own sake, or of mental training. In the former case, it is claimed that the sentence is such an important social instrument, since one uses sentences more frequently than any other tool made by man, that a knowledge of its structure is an essential part of the education of anyone mature enough to understand it. In the latter case, it has been claimed that the study of grammar trains the powers of reasoning and discrimination in an unusually efficient manner and the assumption has been made that this training can be carried over to other situations in which reasoning and discrimination are useful. In recent years certain investigations and discussions have seemed to discredit this assumption, tho to what extent has not yet been fully determined.

But whatever the real extent of the transfer of the training, the startling claims of the opponents of formal discipline have caused such a thorogoing re-examination of the function of the study of grammar in the grades that as a result a third function is now being widely discussed and elaborately analyzed. This is the idea that the justification of grammar in the grades lies in its use for the correcting of errors. The claim is made and substantiated that a knowledge of the reasons for correct forms aids the doubtful memory of forms. It can be pointed out, for instance, that a child that has been using *him and me* in the nominative and has been taught to use *he and I* becomes confused after a time and is uncertain as to which form is correct. Accordingly he sometimes resorts to the use of *he and I* exclusively in both the nominative and objective case. At other times, by a sort of random selection, he uses them indiscriminately. It is at this point that a knowledge of nominative and objective cases is useful when their object and subject relations give him an anchorage by which to stabilize the use of both forms.

Whether or not this function of grammatical study is the correct one we are as yet unable to say. But it seems so reasonable and is so rich in suggestion that investigators are amply justified in working the idea thru and developing all the value contained therein. I, personally, am quite firmly of the opinion that unless this function can be justified, there is no other adequate justification of any sort for the spending of two years or more in the grades upon the subject. My reasons for thinking this are the following:

In the first place, the subject is barely within the range of ability of seventh- and eighth-grade children. Studies of children's ability to parse show a much lower level than is found in spelling or arithmetic, reading, geography, or history. Grammar is just on the margin of inclusion, as shown by the further fact that an excellent teacher of grammar can teach a majority of her class, but by no means all, to parse and analyze, while an average teacher makes a failure of the task. Because of these facts it would appear that the first reason for the study just mentioned, namely, that children should know about such an important social tool, is not valid for seventh- and eighth-grade children and that the subject should on those grounds be left for study in the high school. Or, if this were not done, then a less thorogoing study should be made of the structure of the sentence if it is taught in the seventh and eighth grades. Such a study would have as its function the teaching of the parts of speech, declension forms, and some analysis of simple sentences together with the recognition of phrases and clauses. This study should resemble our present study of grammar to about the same degree that hygiene and physiology resemble scientific college physiology or nature study resembles high-school physics and biology.

In the second place, the evidence against the transfer of training in reasoning and discrimination has been so severely shattered that it is not likely, even under the most favorable construction, to maintain sufficient validity to warrant the teaching of grammar, especially since it is so difficult for children. Because of this fact, I do not see how we can justify the inclusion of the subject in the seventh and eighth grades upon the grounds of its training value. Even if there were considerable transfer of training, so few children master analysis and parsing adequately that in most grammar classes so little is gained in the way of training that there is nothing of importance to be transferred.

In the third place, it remains to be seen whether transfer will function in the correction of errors. Theoretically, it seems that such would be the case since reasons for facts are supposed to aid the memory of facts. Logical memory is usually more retentive than mechanical memory, but whether the subject is too difficult to be used effectively even for this very valuable purpose, and whether the effort put forth pays in results, remains to be determined. However, the use of grammar in correcting errors does not require a full analysis and parsing of all sentences. In many cases certain scraps of information are usually sufficient, as, for instance, in the sentence (Who or whom) do you see? Here it is necessary to parse only one word, *whom*, and even in that case all that is necessary is to know objective case and object of the verb *do see*. The other portions of a complete parsing of the pronoun are not necessary nor does the parsing of the remainder of the sentence need to be carried on. Then, too, pronouns and past tenses constitute most of the difficult grammatical facts since there are few errors in nouns, prepositions, conjunctions, and interjections, and the errors in adjectives and adverbs are comparatively simple to understand. But whether these few facts can be used without a knowledge of more grammar is as yet unknown.

Consequently, because of the difficulty of grammar for the seventh and eighth grades and the lack of knowledge concerning transfer, the inclusion of formal grammar for elementary schools rests upon its relation to the correcting of errors, or upon nothing.

If we accept this functional point of view of the study of grammar, two or three considerations follow:

In the first place, the grammar to be taught must be based upon the grammatical errors which children make. These are of two sorts, oral and written. Both types include errors not usually classed as grammatical, such as the spelling of *to*, *two*, and *too*, which can be explained on the basis of *to*, a preposition, *two* as an adjective, and *too* as an adverb, or the punctuation of a sentence, as the use of commas before and after nouns in apposition. Written grammatical errors include certain items which do not appear in oral speech, such as the spelling of homonyms, as above, capitalization of proper nouns, periods, exclamation marks, etc. But these errors, both oral and written, can be determined, and in the case of oral errors, particularly, quite extensive studies have been made.

Once these errors have been found they can be classified, and certain rules, about thirty in all, are found to be broken. Then it becomes necessary to find out what additional facts of grammar must be known in order that the rules may be understood. For instance, the rule which runs, The subject of a verb is in the nominative case, necessitates for a clear understanding a knowledge of nouns, pronouns, verbs, subject, and predicate. When the rules that have been broken and the grammatical declensions which are necessary to understand them have been collected, we have the course of study in grammar much in the form worked out in the Kansas City Grammar Study and reported in Part I of the Sixteenth *Yearbook* of the National Society for the Study of Education.

Quite significant is the fact there noted that mood, infinitives, gerunds, and participial constructions are excluded from the course of study and, on the whole, a much simpler course of study is obtained than is found in the typical modern textbook; but whether the analysis of sentence in terms of this simpler subject-matter is too difficult for seventh- and eighth-grade children remains to be seen.

In addition to the fact that the subject-matter must be determined upon the basis of errors and to the further fact that grammar is used for the correcting of errors, the hold upon the subject must be automatic. Automatic oral parsing is an absolute essential to efficiency. Greater speed in parsing is necessary than in the fundamental processes of arithmetic, for while arithmetic is used only occasionally, the necessity for choosing between right and wrong forms in grammar is constant. Whenever a person talks he needs the information. Furthermore, he has to make his decisions on the spot. If, as he converses, he forgets whether *He doesn't* or *He don't* is correct and calls upon his knowledge of grammar to assist, he must make his decision about singular noun and singular verb forms instantaneously. If he cannot do it

Pupil's Scores
Language...............
Grammar...............

UNIVERSITY OF ILLINOIS
Urbana, Illinois

BUREAU OF EDUCATIONAL RESEARCH

DIAGNOSTIC LANGUAGE AND GRAMMAR TEST

PRONOUNS

By W. W. CHARTERS

Grades VII and VIII

PART I

Post Office.....................................County.................................State..................Date.......

School.....................................Pupil's Name..Age.........Grade......

DIRECTIONS FOR GIVING THE TEST

After telling the children not to turn the papers over, distribute Part I, this side up. Have each pupil fill in the blanks at the top. Then read the following instructions with the pupils:

Instructions to be read by teacher and pupils together

"This test is given to pupils who have studied language and grammar to see how much they know about pronouns. On the next page will be found exercises like the following:

1. I told him to go.

.... { ....
  ....

"Read this sentence over carefully and see if it is correct. If it is correct, copy it exactly on the dotted line below. The sentence, *I told him to go,* is correct so we shall write it on the dotted line below. We shall now write this sentence in." (The teacher should pause while this is done.)

"If the sentence is not correct, we are to write the correct form on the dotted line below and on the right half of the page we shall give the reason for making the correction. Let us try one."

2. I told he to go. {..

.... {..

"The correct form is, *I told him to go*, so we shall write *I told him to go* on the dotted line below." (The teacher should pause while this is done.)

"On the right-hand side we are to tell why we make the change on the left-hand side. We always begin our reason for the change with the word *Because*. In this case we write—*Because him is in the objective case, object of the verb, told*. (The teacher should pause until the pupils write the reason at the right of the sentence.) We must not write too large and we may use both of the lines on the right-hand side so that we may have plenty of room for giving our reasons."

"We shall now try a third exercise."

3. It is hisn. {..

.... {..

"The correct form is *It is his*. We make the change *Because his is the possessive form of the pronoun, he*. Fill this in correctly, writing the correct form on the line below and beginning the reason on the right-hand side with the word *Because*. Do this now.

"Remember that if the sentence on the left is correct, we do not need to write anything on the right-hand side because we have to make no change and so have to give no reason for making a change."

The teacher should pass around the room and see that the children fill these in correctly and when all have finished he should say, "Turn your papers over and begin the work." This is not a speed test so ample time should be allowed to each to finish. This test should be completed in two periods during the same day. Part I should occupy the first period, and Part II the second. At the beginning of the second period, go over the above instructions so far as may be necessary and distribute Part II. After children have finished Part II, collect papers and assemble Parts I and II for each child, fastening them together.

	Language Value		Grammar Value
1. John went to town.	1	1..	1
2. May Inez and me go?	1	2..	2
3. It teaches a person something you may use.	3	3..	5
4. Yous girls play too hard.	1	4..	3
5. When one lives in town they hear noises.	3	5..	3
6. That is hern.	2	6..	2
7. Who do you want?	2	7..	3
8. Him and I will do it.	2	8..	2
9. Us boys did it.	2	9..	3

10. The boy was raised by its own mother.	2	10....................................	3
11. These books are yourn.	1	11....................................	3
12. It was a book with riddles in them.	1	12....................................	3
13. Are those them?	3	13....................................	3
14. Mary and her mother are here.	1	14....................................	1
15. It was only us.	3	15....................................	3
16. They made baskets and filled it with holly.	1	16....................................	3
17. They went in a ship who sailed on Friday.	2	17....................................	3
18. The pencil is hisn.	1	18....................................	2

PART II

Pupil's Name .... Date ....

	Language Value		Grammar Value
19. I am older than him.	2	19	3
20. I and my sister went home.	2	20	4
21. Them are mine.	2	21	3
22. He pushed John and I.	3	22	3
23. He corrected his work his self.	1	23	3
24. It was me.	2	24	3
25. He struck a girl which was near by.	3	25	3
26. Annie called to you and I.	2	26	3

27. Her and I used to play together.	2	27.	2
28. Was that him?	3	28.	3
29. I want him to go.	1	29.	1
30. That's her.	3	30.	3
31. You and them must decide.	2	31.	3
32. Every girl took their seat.	2	32.	3
33. We found ourself in a large room.	2	33.	3
34. They kept theirselves hidden.	2	34.	3
35. Who did you speak to?	2	35.	3

36. He found a hole what he could get into.	2	36.	4
37. They were afraid to show themselfs.	2	37.	3
38. The princess called he Moses.	1	38.	2
39. The boys will soon catch they.	1	39.	2
40. It is whom?	3	40.	3
41. Brother John and myself went home.	2	41.	3
42. I told she to be still.	1	42.	2

at once he is compelled to use whichever comes first, if he happens to be talking enthusiastically; or, he is compelled to halt while he is deciding the matter and thereby loses greatly in effectiveness of speech. In arithmetic, if it becomes necessary, he can take pencil and paper and figure the result, but in speech he cannot stop and diagram his sentences.

From this point of view, written analysis and written parsing are only means of attaining facility of oral parsing. They cannot be the end of effort.

Perhaps when this is recognized and grammar is seen in relation to its automatic outcome and all drill devices are used by teachers to attain this end, grammar will be more useful than it now seems to be as an aid in speech. Teachers have taught grammar for so many reasons other than the correction of errors that they have not made drill sufficiently rapid to function properly and this may be the full cause of the failure of functioning. For if adequate speed is not acquired, less than adequate speed is useless. It is a case of all or nothing.

With these two standards once recognized, namely, a grammar based on errors and a study of grammar culminating in automatic action, diagnosis may begin. Complete diagnosis will be of two sorts. These will be the diagnosis of the ability of children to apply rules when time is given, and of their ability to do it speedily. For only the first of these have tests been made, if we do not count Starch's tests to determine pupils' ability to recognize parts of speech and declension forms. In the grammar test on pronouns[1], it will be noted that it consists in part of the language test which was distributed yesterday. The items of the language test are shown on the left-hand side of the page. In addition, on the right are blanks for giving the reasons for the corrections made on the left.

The weighting should also be noted, for the same observations as to method of determining these and the expectation of discarding them in our next form, as were made yesterday, hold.

When we consider the decision as to whether or not the grammatical reason given in any case is adequate, the task is much more difficult than in the case of language. The query as to what is the correct answer is difficult to decide upon, so considerable help in making the decision is necessary.

Negatively, it is obvious that such answers as, *It is not polite,* or *It does not sound right,* are not correct since grammatical reasons must be stated in terms of grammatical facts and rules. These are merely language reasons.

Positively, an answer is adequate if the declension and the syntax are both given. In the sentence, *Was that him?, Because "he" is a pronoun in the nominative case, complement of the verb "was"*, is adequate since it mentions both the case (nominative) and the syntactical relation (complement of the verb *was*). If all answers included these two factors, the decision would be easy, but what shall we do with an answer such as this: *Because "he" is nominative case*? Is this adequate? It is not for a teacher of grammar who will insist upon the statement of relation, but for the practical purpose of seeing if the pupil has some grammatical reason for his correction it is probably sufficient. To know that the nominative case should be used is adequate, particularly when the student may know the syntactical relation but has not been drilled in the precise form which the answer should take in such a test as this. Again, a pupil may say, *Because "he" is the complement of the verb "was"*. Such an individual, of course, omits mention of case, but he may have forgotten to mention the case which may have been well known to him and, therefore, for practical purposes of speech the statement of relation may be a sufficient answer. As said above, the teacher will not be satisfied with the inclusion of one of these elements, but the grader, it seems to me, should give the pupil the benefit of the doubt, until such time, at least, as definite forms of answering the test have been agreed upon and are commonly used.

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[1] Reproduced on the preceding pages.

It would seem, therefore, that for testing purposes either declension forms and syntactical relations, or declension forms *or* syntactical relations alone would be considered an adequate answer. But for the diagnostic purposes of the teacher both should be included.

What was said with regard to language diagnosis holds for the diagnosis of grammar. Diagnostic tests must show specific difficulties and not general deficiencies. The teacher should be able to know after the test is given which rules the children can use when given sufficient time to write them and which children are better and which are poorer, and in which respect each child is superior or deficient.

The diagnostic test in grammar obviously cannot be given until after the topics in grammar have been studied because the children do not know the terminology before that time. But once they have been studied it is then possible to give the test to succeeding classes thruout the grades and the high school from year to year to determine what points still need to be drilled upon by succeeding English teachers.

As a matter of practical importance it must be stated that any superintendent can construct diagnostic tests in language and grammar for himself. If he wishes to compare his classes with those of other systems he should use the standard forms, but for purposes of diagnosis within his own system he can make his own tests and even have them written on the blackboard. This is the case because such tests do not include a time element and, furthermore, our studies show that weighting is not necessary. If each sentence is given the value of *one*, the results are almost identical with those in which weighting values are used.

Consequently, what such a superintendent needs to do is, first of all, to collect the errors made in his system and from these select certain important ones in the form of incorrect sentences. Then he should ask the teachers to have the children write the corrections, in the case of language diagnosis, and to give the reasons for corrections, in the case of grammar diagnosis.

In the matter of grammar correctives it may be stated that these may be collected, but chief reliance must be placed upon definitions of grammar and parsing and analysis, particularly as an oral exercise, until the children can instantaneously tell, with reasons, which are the correct and which the incorrect forms.

Demonstration of the Use of Group Tests of Intelligence

Reported by Sidney L. Pressey, Research Assistant in Psychology, Indiana University

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At 1:15 on Friday afternoon Dr. Sidney L. Pressey gave a demonstration of the "Cross-out" Tests.[1] He tested the audience, using a modified form of the directions, as given below:

Test I

Each of the twenty-five lists on the page is a sentence with the words mixed up. But in each list there is one, and only one, word that cannot be used in making the sentence. You are to cross out this extra word. Study the examples and then begin. (3 minutes.)

Test II

In each of the twenty-five lists there are four things that are, in some important way, alike, and one thing that is different from *all* the other four. You are to cross this one thing out. Study the examples, and then begin. (2 minutes.)

Test III

In each of the twenty-five lists the numbers are arranged according to some rule, but there is in each list one, and only one, number which breaks the rule. You are to cross out this number. Study the examples and then begin. (3 minutes.)

Test IV

In each of the twenty-five lists you are to cross out the thing that is worst. Study the examples and then begin. (2 minutes.)

Immediately following this demonstration a class of 1A children were brought into the room and examined by Mrs. Pressey with the Primer Scale.[2] The directions and examination blanks are reproduced below:

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[1] This test is reproduced in full on pp. 26 et seq. In the blanks used at the Conference the correct words or numbers in all the examples were crossed out.

[2] This scale is reproduced in slightly reduced form on pp. 30 et seq.

(Blank 1)

MENTAL SURVEY SCALES

Schedule E

"Cross-out" Tests

Name ....Sex ....

Age ....Birthday ....Grade ....

Teacher ....School ....

Place ....State ....Date ....

TEST I. VERBAL INGENUITY

Examples: (a) See a I man on.
(b) knife chair the sharp is.
(c) in winter with covered trees is ground the snow.

Score (1)..........
(4)..........

(1) the cat at see.
(2) boy was sky the sick.
(3) bread sweep will the kitchen I.
(4) are going yesterday to-morrow we.
(5) me mine give my straw hat.
(6) brown the horse come is.
(7) my suit dollars wear twenty cost new.
(8) know ice big boys how skate to.
(9) their soldiers for fight gun country.
(10) teacher me from gave a pencil my.
(11) brother lamp is my than I older much.
(12) dusty road the is hot and miles.
(13) in the chalk he brightest is boy class our.
(14) roads hard to is climb steep very the hill.
(15) broke his robin the flew little poor wing.
(16) gave me candy brother my of knife a box.
(17) told girl I I the to would her with home walk.
(18) watch summer the man stole is jail who the in.
(19) man whom the hat saw is you uncle my me with.
(20) I not Monday do to bag like go to school on.
(21) do not boy the I like who me school in sits desk behind.
(22) old back only the chair legs has three black.
(23) the from flood came mountain the valley bridge the down.
(24) who the sing birds so flown during the sweetly to have south.
(25) boy gold who highest watch jumps over the get the will a.

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TEST II. LOGICAL JUDGMENT

Examples: (a) dog, cow, horse, oak, cat.

(b) book, newspaper, magazine, pamphlet, photograph.

(c) base-ball, skating, checkers, tennis, dominos.

(1) coat, shoes, hat, gloves, sail.

(2) oats, wheat, barley, cotton, rye.

(3) satin, silk, fur, calico, serge.

(4) fly, ant, bee, grasshopper, mouse.

(5) bread, meat, vegetables, hay, fish.

(6) river, lake, brook, pond, ocean.

(7) beef, lamb, bread, mutton, pork.

(8) house, barn, shed, cave, church.

(9) sparrow, eagle, robin, owl, hawk.

(10) tyranny, equality, democracy, freedom, liberty.

(11) red, green, yellow, white, blue.

(12) orange, tomato, apple, peach, plum.

(13) mother, cousin, uncle, father, aunt.

(14) oblong, triangle, square, octagon, circle.

(15) iron, gold, platinum, copper, sulphur.

(16) auto, horse, bicycle, steamboat, canoe.

(17) grocer, lawyer, doctor, minister, professor.

(18) mumps, deafness, tuberculosis, measles, diphtheria.

(19) guitar, banjo, violin, flute, mandolin.

(20) fox, wolf, dog, eagle, hawk.

(21) kerosene, alcohol, coke, cinders, coal.

(22) piston, boiler, valve, fire-box, dynamo.

(23) pine, hemlock, maple, fir, spruce.

(24) mayor, lawyer, alderman, senator, governor.

(25) carpenter, bricklayer, machinist, bookkeeper, plumber.

TEST III. ARITHMETICAL INGENUITY

Examples: (a) 2 4 6 8 9 10 12

(b) 6 7 5 4 3 2 1

(c) 1 2 4 8 16 17

(1) 1 2 3 9 4 5

(2) 2 4 6 7 8

(3) 10 9 8 7 6 4

(4) 11 10 8 6 4 2

(5) 5 7 10 15 20 25

(6) 3 6 9 11 12 15

(7) 19 18 17 16 13 15

(8) 4 8 10 12 16 20

(9) 2 4 8 10 16 32

(10) 1 5 9 11 13

(11) 27 24 21 19 18 15 12

(12) 1 3 5 7 9 10 11

(13) 16 8 4 3 2

(14) 4 9 14 19 24 29 33

(15) 2 6 12 24

(16) 17 13 9 7 5 1

(17) 36 18 9 3

(18) 3 9 12 15 21 27

(19) 2 4 8 16 24

(20) 27 22 17 14 12 7

(21) 3 9 27 54 81

(22) 3 6 9 12 24 48

(23) 84 77 70 65 63 56

(24) 1 3 9 18 27

(25) 72 36 18 9 6

Score (2)..........

(3)..........

TEST IV. MORAL JUDGMENT

Examples: (a) Gambling, lying, drunkenness, murder, smoking.

(b) begging, gambling, trading, cheating, borrowing.

(c) dullness, foolishness, laziness, weakness, poverty.

(1) fighting, killing, hating, quarreling, hurting.

(2) borrowing, gambling, overcharging, stealing, begging.

(3) love, hate, fondness, dislike, liking.

(4) dancing, drunkenness, flirting, over-eating, smoking.

(5) holiness, reverence, piety, obedience, wickedness.

(6) kindness, roughness, cruelty, pity, harshness.

(7) sincerity, honesty, self-confidence, frankness, deceit.

(8) stinginess, carefulness, generosity, charity, economy.

(9) patience, caution, eagerness, recklessness, thoughtfulness.

(10) bashfulness, meekness, cowardice, foolishness, timidity.

(11) justice, fairness, shrewdness, honesty, trickery.

(12) laziness, idleness, tardiness, slowness, haste.

(13) flattery, lying, fibbing, slang, gossip.

(14) stupidity, dullness, foolishness, dishonesty, ignorance.

(15) meekness, vanity, self-confidence, self-esteem, self-respect.

(16) rudeness, impudence, insult, discourtesy, impoliteness.

(17) patriotism, disloyalty, double-dealing, treason, fraud.

(18) bigamy, flirting, indecency, immodesty, indelicacy.

(19) gentleness, kindness, hesitancy, weakness, caution.

(20) courtesy, pleasantness, friendliness, kindness, flattery.

(21) laziness, over-eating, dissipation, extravagance, smoking.

(22) thieving, cheating, forgery, unfairness, begging.

(23) perjury, lying, swearing, slang, deceiving.

(24) bullying, stealing, blackmail, cheating, swindling.

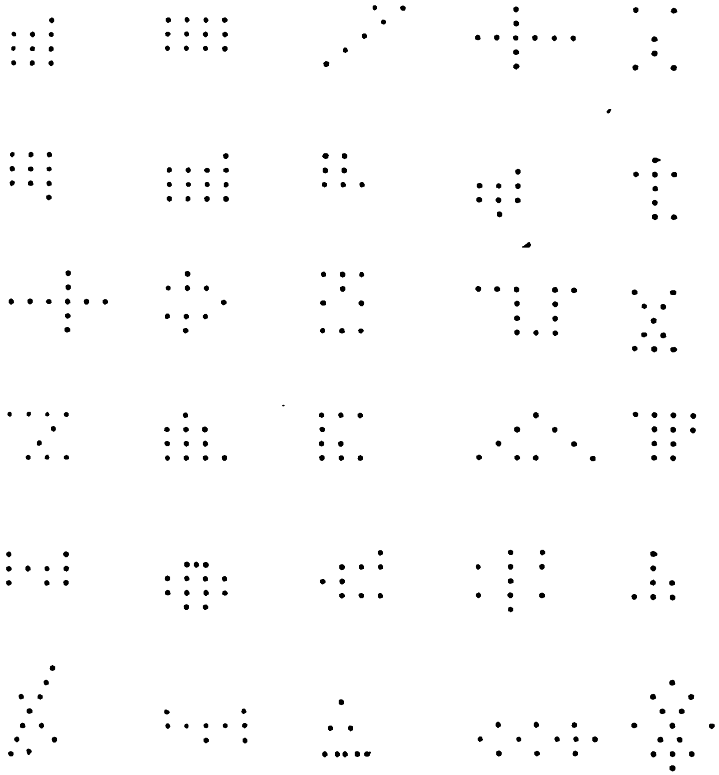
(25) frankness, sincerity, simplicity, trustfulness, pliability.

Schedule F

Mental Survey Tests—Primer Scale

Name____

I. DOT PATTERN TEST



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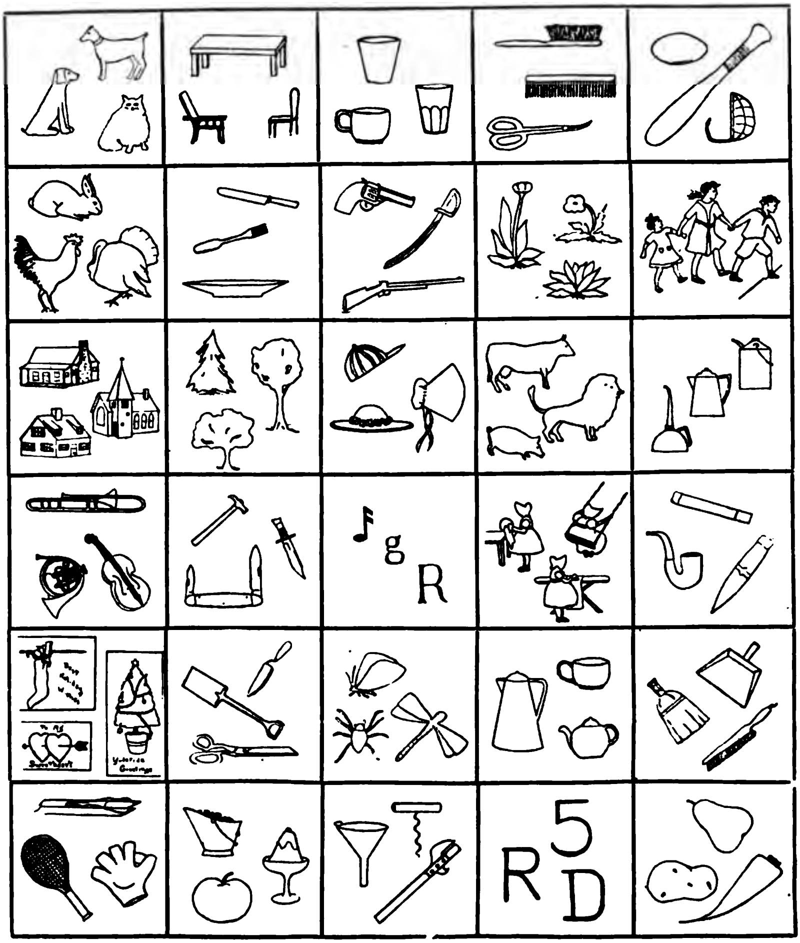
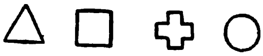
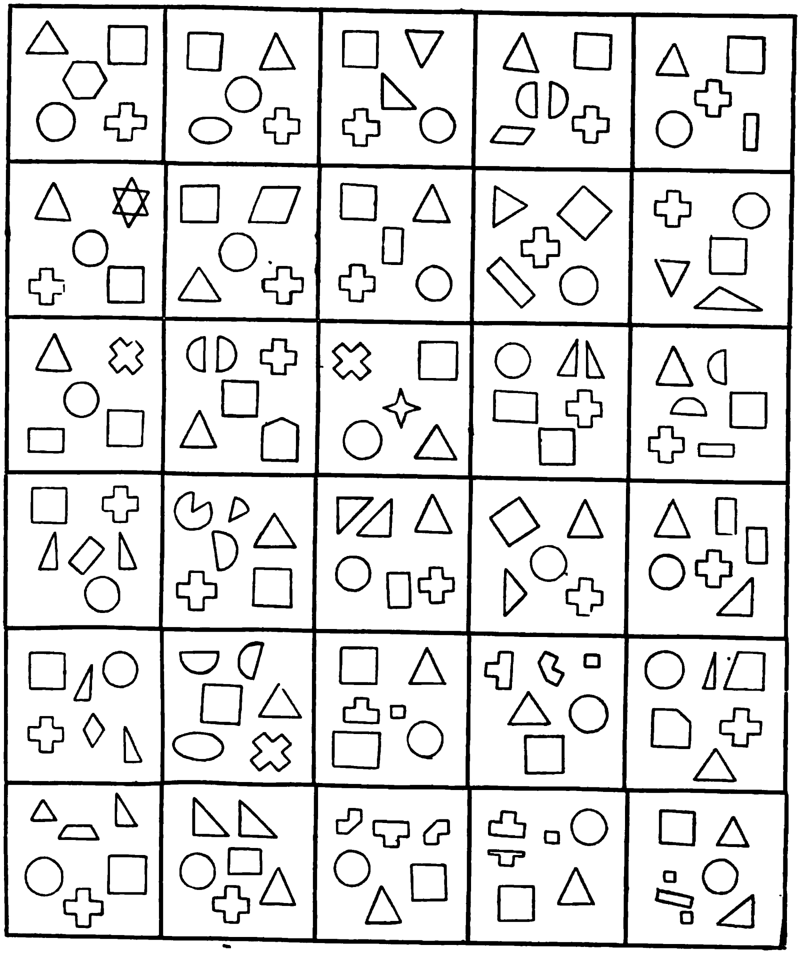
1. CLASSIFICATION TEST

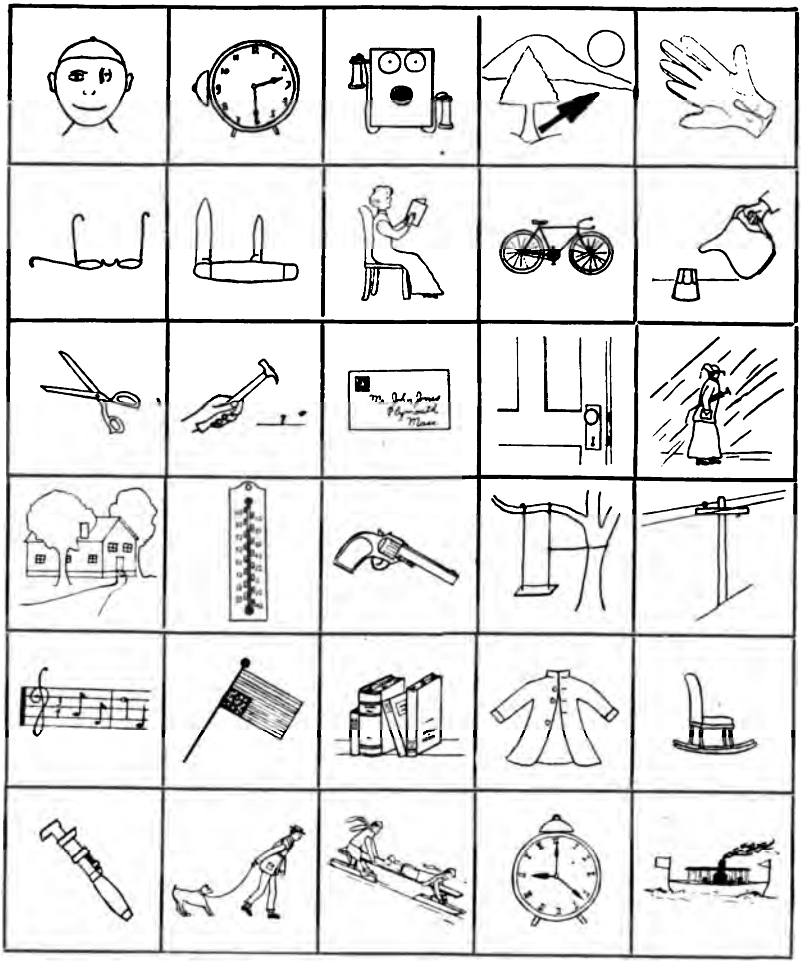


III. FORM BOARD TEST





IV. ABSURDITIES



DIRECTIONS TO EXAMINER

The examiner must go very slowly and make sure that each step is understood by all. However, there must be no lagging; the entire examination must not take more than twenty-five minutes, and should be given in less time in the third grade, where the directions can be read more rapidly. No one should attempt the examination until he has thoroly mastered the technique, as the slightest hesitation on the part of the examiner is immediately reflected by bewilderment and confusion on the part of the children. Every effort should be made to make the examination as informal, and as much like a class exercise, as possible. *No* questions should be permitted during the examination, however.

The children must be constantly watched for copying, as they are not yet old enough to understand that they should not do this. The examiner should always have on hand a supply of pencils; and no child should be allowed to lose time because a pencil breaks during the examination. If a child comes in late, leaves the room during the examination, or has his work otherwise interfered with, his paper should be distinctively marked at the time by the examiner. Note should also be made of any children troubled with deafness, poor eyesight, or any special defect.

It is well to have the teacher (if the examination is not to be given by her), *during* the examination, make out a rank order estimate of the ability of her pupils. Primary children are very dependent upon their teacher and, unless she is definitely removed from the examination, will look to her for permission every time the examiner gives a direction.

In giving the examination the examiner should have his own copy of the blank on which he should show the *general* position of the first example of each test, locating it in the upper left-hand corner of the page.

DIRECTIONS FOR SCORING

1. In each test the first five problems across the page are used as examples; do not count these in the score. In each test, each item correctly marked counts one point; the highest possible score in each test is thus 25.
2. Any mark (whether a single line, a cross, a dot, a line drawn around the object, or any other mark) that clearly indicates the correct object or part should be scored as correct. In general, when scoring is doubtful, give the child the benefit of the doubt.
3. If more than one dot in a group (Test I), object in a square (Tests II and III), or part in a picture (Test IV) is crossed out, score that problem 0.

The total score on the examination is the sum of the scores on the four tests. Arrange the papers for each room in order of total score and record the results on the opposite side of this page. Be sure to fill in all the information called for. Under age put age at last birthday; under grade put grade and half grade, and F for fast section, S for slow section, if the class is thus divided.

Tear the page in two on the dotted line; keep the "Teachers' Record" and return the other half to the Department of Psychology, Indiana University, Bloomington, Indiana.

DIRECTIONS FOR GIVING THE PRIMER SCALE[1]

(Have the blanks already folded. Pass them out quickly, not giving the children time to study the tests or talk about them before the examination.)

Now is there any one of you who has *not* a blank and a good, sharp pencil? Hold up your hand.

Write (or print) your name on the line at the top of the page, then write your grade in the next space, and in the last space your age. (If the children cannot write, the teacher should be given the blanks some time before the examination, and should have them labeled and ready to give out to the children immediately at the time of the examination.)

Now attention! Look at the first page of your paper—the page that has the dots on it...And be sure you have the page so your name is at the top.

TEST I

Look at the first group of dots at the top of the page. (Hold up copy and indicate general position.) Can anyone see an extra dot—one that is out of place?...Where is it?...Yes, above all the others. Now I want you to take your pencils and cross out that extra dot. Just draw a line thru it. (Make sure that *all* the children get this first example correctly crossed out.)

Now look at the next group of dots, just *beside* the first group. Where is the extra dot?...Yes, below all the others. Everyone cross out the extra dot. Draw a line thru it.

Now look at the next group, just beside the last one. Where is the extra dot?...Yes, above the line. Now all cross it out.

Now look at the next group. Where is the extra dot?...Yes, the last one on this side (gesture to the children's right). Cross it out.

Now look at the last group. Where is the extra dot?...Yes, the one just below the middle dot. Cross it out.

Now, everyone attention! Finish the other groups of dots on the page in the same way. In each group there is just *one* extra dot. Cross it out. (Time allowed pupils, 3 minutes.)

Open the blank into the middle. Fold it over—so. Lay it down on your desks so the pictures are on top. (Do this with the children so that they may copy your motions.)

TEST II

Look at the first picture. What do you see?...(If the children do not name all the objects at once, keep asking, "and what else?" until everything in the square has been named.) Is there anyone who does

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[1] These directions are slightly modified from those used at the Conference, and are for the final revision of the scale, not for the form presented.

not see the two dogs and the cat?...Which two things are most alike?... Yes, the two dogs, and which one is different from the other two?... Yes, the cat. Now, I want you to cross out the cat, because it is different from the other two.

Look at the next picture. What do you see?...What two things are alike?...What one is different?...Yes, all cross out the cup.

What two things in the next picture are alike?...Which one is different?...Yes, cross out the curved (or crooked) line.

What two things in the next picture belong together?...Yes, the comb and brush. And what thing doesn't belong with them?...Yes, cross out the scissors.

Look at the last picture. In what game do you use the bat?...(If the children answer "ball game" ask "what kind of a ball game?") In what game do you use the mask?...In what game do you use the ball?...Then, what two things do you use in the same game?...Yes, the bat and the mask. And what thing do you use in a different game?... Yes, the ball. All cross out the ball.

Now, everyone attention! Finish the other pictures on the page in the same way. In each square, cross out the *one* thing that is different from both the other two. (Time allowed pupils, 3 minutes.)

This time do not open your blank, just turn it over to the page that has the little blocks on it.

TEST III

Look at the four places at the top of the page (point to the four forms). Do you all see them?...

Now look at the first square. Do you all see the little 3-sided piece in the upper corner?...Will it just fit into any one of the four places at the top of the page?...Which place?...Yes, the first one. Will the square piece beside it fit in?...Which place?...Will the cross?...Which place?...Will the round one?...Which place?...Now you have filled up all the places at the top, haven't you?...And what piece in the square have you left over?...Yes, the piece in the middle; it won't fit in anywhere. So cross it out.

Look at the next square. Will the first piece fit in?...Will the 3-sided one beside it?...Will the round one?...Will the cross?...And what piece have you left over?...Yes, the one that looks like an egg or a football. Cross it out.

Look at the next square. Will the first piece fit in?...Will the 3-sided piece fit in?...Will the round one fit in?...Will the cross fit in?...What one have you left out?...Yes, the one right in the middle. Cross it out.

Look at the next square. Will the top two pieces fit in?...What can you do to the two middle pieces to make them fit?...Yes, put them together. And where will they fit?...Yes, in the round place. Will the cross fit in?...And what one have you left?...Yes, the little flat piece, at the bottom; cross it out.

Look at the last square. Which piece won't fit in anywhere?...Yes the long, thin one in the corner at the top. Cross it out.

Now, everyone attention! Finish the other squares on the page in the same way. In each square, there will be *one* piece left over after fitting all the other pieces into the four places at the top of the page. Cross out the *one* piece that you can't use. (Time allowed children, 3 minutes.)

Turn over to the last page that has some more pictures on it.

TEST IV

Look at the first picture. What is wrong with the boy's face?... Yes, the eye. Cross out the eye, because it is wrong.

What is wrong with the table in the next picture?...Yes, the table has five legs. Which one is wrong?...Cross out the middle leg.

What is wrong with the telephone in the next picture?...Yes, there are two receivers. Which one is wrong?...Yes, the lower one. Cross it out.

What is wrong with the boy?...Yes, his foot is turned the wrong way. Cross out his foot.

Look at the last picture. Are you looking at the back of the glove or the front?...Yes, the back; and does a glove usually open in the front or in the back?...Then what is wrong?...Yes, the opening is on the back, so cross out the opening.

Now, everyone attention! Finish the other pictures on the page in the same way. In each picture cross out the *one* part that is wrong. (Time allowed pupils, 3 minutes.)

(Collect the blanks at once, not permitting any time for further work.)

(Wherever ?... is used it indicates that the children are to answer.)

A Group Scale of Intelligence for the First and Second Grades

Mrs. Sidney L. Pressey, Graduate Student, Department of Philosophy, Indiana University

In the survey work which my husband and I have been doing this last year, we have been confronted with two main and very distinct problems. The first of these is to determine the kind of "pupil material" with which a school has to deal. This "pupil material" is sometimes of high native ability, sometimes of poor native ability; it is sometimes very homogeneous in its native endowment, and sometimes very heterogeneous. The first problem is, then, to determine the nature of this "pupil material". The second problem is to determine what the school has done with the material that has come to it.

Educational measurements have already made us familiar with the idea of group testing to discover to what level of attainment the school brings its material. We test progress in reading, writing, and geography, and in almost all other subjects, and we do it almost wholly by group testing. But there has been little systematic group measurement of the material with which the school has to deal. Yet I am sure that most of you would agree that schools may vary markedly in the ability of the children who attend them. In fact, in our survey work last year we found many striking differences between schools in the same system. For instance, one school tested over a year above another school which drew from a different neighborhood, but in the same system. It would seem then a logical step to measure first the material with which a school has to work before determining the methods it shall use or the results it shall obtain. Any fundamental differences in natural endowment should certainly be known to superintendents and teachers and should be taken into account in judging the accomplishment of these schools and in any complete understanding of their many problems.

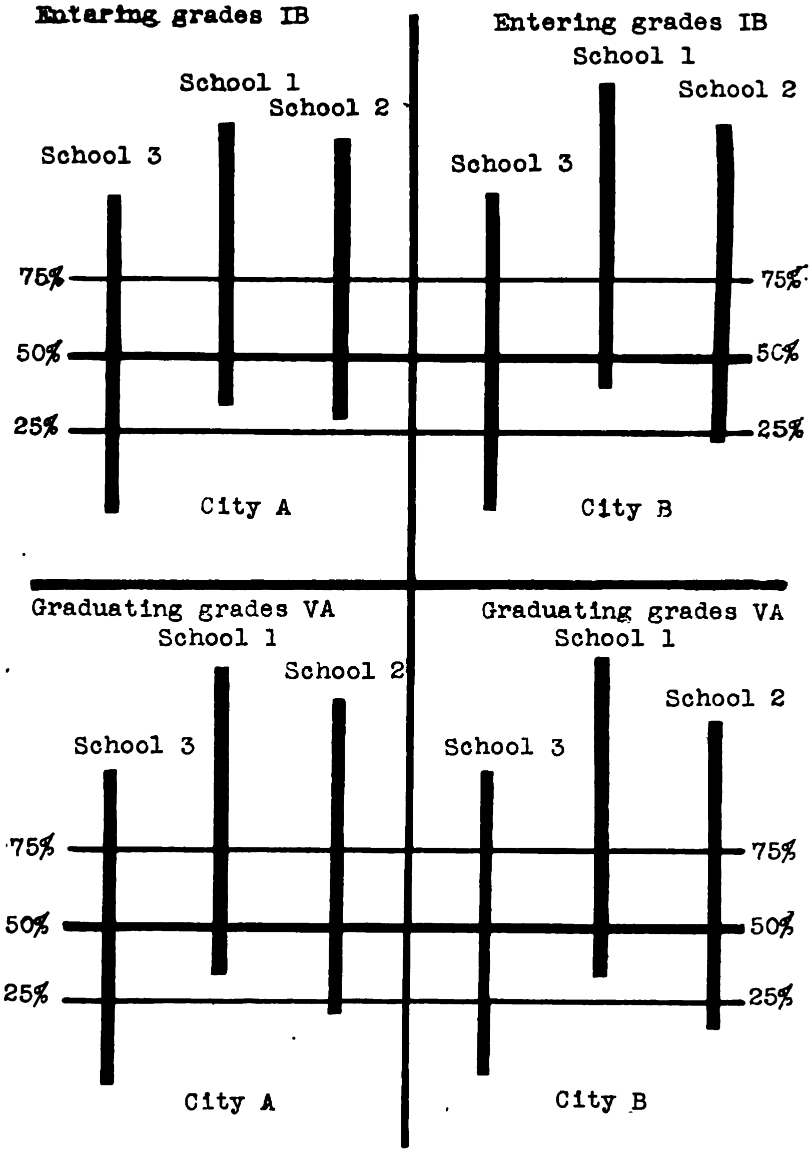
But we found it exceedingly difficult to obtain satisfactory measures of these differences if tests, which could be given only in the upper grades, were used. Grade selection in any grade above the first profoundly influences the make-up of the grade. For instance, in one school recently tested there was twice as much retardation and only half as much acceleration as in another school in the same system. It is evident that the children in the upper grades of one of these schools were a far more highly selected group than the children in the upper grades of the other school. Therefore, a test based on the upper grades only is but a partial statement which is *quite* as dependent upon school selection as upon the natural abilities of the pupils. The natural way to overcome these difficulties and obtain a true measure of the "stuff" with which the school begins its work was to devise a scale for measuring the abilities of the children at entrance, or soon enough after entrance so that these influences of selection and training have not had time to operate. The Primer Scale which I demonstrated a short time ago was the result of our attempt to solve this problem. I wish now to give you briefly certain facts which we have thus far found to show that these differences are really there and that the scale does measure them.

The results may be either in the form of group comparisons or individual diagnosis—the former being by far the more important and reliable of the two. Group comparisons may result in (1) comparison of entering classes—or of all the six-year-old children in a school—to determine the general level of ability; (2) a comparison of the range of abilities within a given grade or among these same six-year-old children; (3) a comparison of strong and weak sections within a single school with the idea of making each section a more compact unit for teaching purposes. As regards individual diagnosis, there are the usual two possibilities: first, the locating of bright and dull children for more intensive study; and, secondly, the locating of children who are misplaced and belong in some other grade than the one they are in. I shall take up these points in the order mentioned.

There are, in each of the two cities upon which these results are based, three ward schools. I shall be chiefly concerned with the first of these two cities, which I shall call City A. Two of its ward schools draw from the best sections of the city, but each one also draws from a neighborhood where the poorest families—the trash of the city—have their homes. The third ward school draws from a neighborhood of self-supporting, laboring people,—a neighborhood which has no homes of professional or successful business men, but which, on the other hand, has only a few destitute families. Since the first two schools I mentioned are somewhat similar in the make-up of their population I shall use the first of them only as a basis of comparison with the third school. In the other city, City B, I have selected the best and worst schools for comparison.

By both age and grade the third school (the poorest one) in City A, tests greatly below the median for the first school (See Figure 1). The difference in median is equal to the difference between the six-year and the seven-year medians, or just equal to a whole year in "mental age". This third school has, then, definitely inferior stock with which to deal; yet it is supposedly using the same methods and teaching the same subjects as the school whose median is more than twice as high as its own. The results of this policy are observable even as early as the first, second, and third grades (which were all tested by this scale). This third school, in these three grades, averages 26 per cent retardation,—twice as much as the first school, and has no acceleration whatever, while the first school averages 13 per cent acceleration. In other words, the poorest school is attempting by excessive retardation to bring its inferior pupils with the *same* methods to the *same* achievement as the

FIG. 1. A COMPARISON OF THE ENTERING (IB) AND GRADUATING (VA) GRADES IN THE THREE WARD SCHOOLS OF TWO CITIES.



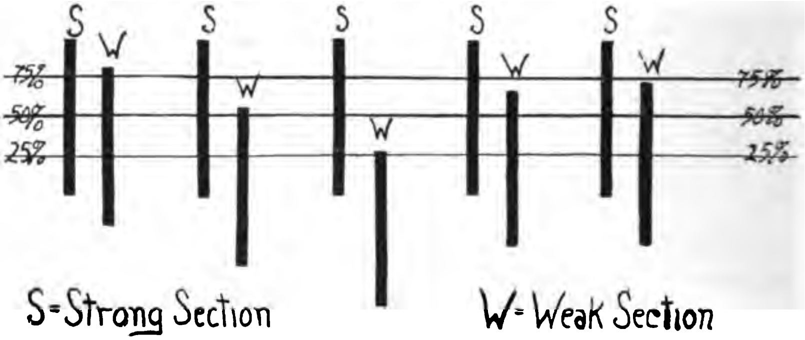
The comparison in each city is with the poorest school (School 3). The other schools are shown as having so much in per cent above the median for the poorest school. The graduating grades of the three schools in each city will furnish pupils for the *same* grade of one junior high school.

pupils in the best school. The fact that the grade norms are twice as far apart as the age norms would evidently indicate that this has not been done. This policy of excessive retardation, which is as high as 50 per cent in the fourth and fifth grades, is apparently the only attempt at adaptation to its inferior material that the school has made. Very vital questions are raised by such a situation. Should the goal of achievement be always the same? Should the methods be always the same? If the school's reaction in retarding its pupils is not sufficient to meet this difficulty, what else is there that the school can do? Whatever the answers to these questions may be, it is evident that the schools in which the pupils are of inferior stock—and there is usually at least one such school in every community—must find some way of more adequately adapting their curriculum and methods to the neighborhood which they serve. These two schools, then, in City A have very different problems as regards the general ability of their pupils. The same thing is true in City B. In this city 65 per cent of the primary children in the best school average above their age medians for the primary children in the worst school. The worst school averages, for its three primary grades, 40 per cent retardation, by means of which it has brought its grade medians very nearly up to the grade medians of the best school. It may be, then, that, while the fundamental situation is somewhat the same in City B, it is possible for them to make adequate adjustment to their pupil material by merely retarding their pupils. In City A the adjustment by mere retardation has very evidently not been sufficient. But in both cases, aside from any reaction on the part of the school, whether adequate or otherwise, the basic situation of a marked difference in the pupil material entering the first grade of the first and third schools remains unchanged. The difference in native ability is there, and the scale has measured it.

Turning from the general average of ability among the pupils entering different ward schools in the same system to the range of ability, as indicated by the tests, equally striking differences are found. The first school in City A, drawing from the very best *and* the very poorest elements of the city, has a range among its six-year-old pupils which is 146 per cent of the corresponding range in the third school, which draws from the laboring classes only. It is evident then that this third school in spite of its poorer median showing does not have some of the difficulties which confront the first school. There is an occasional very brilliant or really feeble-minded child, but the school is able to take care of them by acceleration and retardation. There are not enough of either class to be much of a problem. Their problem lies more in the generally inferior ability of *all* the children. The first school, however, finds an astounding range of ability among its six-year-old children. The school has already attempted to meet the situation. It shows for its primary grades 13 per cent acceleration and 13 per cent retardation. There has been then an effort to set off these two extreme classes; but the attempt has been only partially successful, as nearly 50 per cent of the entire population of the school belongs in either one or the other class. There is thus in this first school a clear demand for special classes for its brilliant and subnormal children. The wide range of ability in the first school presents just as much of a problem as is presented by the generally inferior stock of the third school, and calls for just as thoro an adjustment on the part of the school, if the school is to serve its neighborhood to the fullest.

In City B a similar situation, tho a somewhat less striking one, is found. The six-year-old children in the best school show a range of ability which is 122 per cent of the range in the poorest school. The chief difference between the situation in the two cities lies in the lack of adjustment in City B. In its best school, with its considerably wider range, the acceleration of the primary grades amounts to only 7 per cent. For the fourth and fifth grades it is only 1 per cent. There is, however, 23 per cent retardation in the primary grades. The school has apparently made a more than necessary adjustment at the lower end of its distribution, but has made no attempt to take account of the superior abilities of some of its pupils.

FIG. 2. A COMPARISON OF THE STRONG AND WEAK SECTIONS IN THE PRIMARY GRADES IN A WARD SCHOOL IN CITY A.



The comparison is made on the basis of the strong section, the weak section being shown as so much in per cent above or below the median of the strong section.

Wholly aside from the adjustment or lack of adjustment, or particular kind of adjustment, found in the two cities, the underlying problem is the same. It is a problem which would be found in the majority of cities, especially in small cities. A thoro adaptation on the part of any school to its pupil material must be preceded by accurate knowledge of the distribution of abilities among its pupils, as well as of the general level of their abilities. To gain this accurate knowledge some complete mental survey is necessary. Here again it becomes necessary to measure the "pupil material" before determining upon methods to be used or upon the results which are to be obtained.

Many of the primary grade rooms are divided into strong and weak sections. On this chart (Figure 2) I have indicated in diagrammatic form some of the strong and weak sections in the first grade rooms of

City A. All the sections could not be included, but these five are typical. For the most part, while the best section measures as distinctly better than the poorer section, there is considerable overlapping. The data presented in this chart show in the first place a real difference in ability, as measured by the scale, between the strong and weak sections. It also suggests certain shifting of small groups of children so as to make each section a more compact unit for teaching purposes. The scale should, I believe, be of distinct value in this connection, in pointing out the differences between sections and in helping the teacher to make a more accurate regrouping of her children according to their abilities. I am hoping to have under way very shortly an experiment in a certain ward school, in which in some of the rooms the children will be grouped in sections on the basis of the results from this scale—a Binet examination being given whenever the scale results and the teacher's estimate radically disagree. In other rooms of this same school the sections will be formed in the usual way on the basis of teachers' estimates alone. And at the end of the experiment I shall attempt to measure the comparative accuracy of the two methods of selection as far as achievement is concerned.

There remains one other aspect of the results from the Primer Scale to be discussed—their possible value for purposes of individual diagnosis, in the strict meaning of that term. The scale ratings give an average correlation with the teacher's ranking of her pupils in order of their ability, as she estimates it, of .58. The third grades were tested with both the "Cross-out" Scale and the Primer Scale; the correlation between the findings on the two scales was .64. When the scores of the pupils are grouped according to their ages it appears that a large majority of the accelerates rate in the uppermost 10 per cent of the distributions, and most of the retards in the lowest 10 per cent. There is thus some evidence to indicate a fair reliability of the scale in the individual case. But it must be remembered that the children are very young and are easily distracted by breaking a pencil, or by some other incidental happening during the examination, and that too much must not be expected of any examination under such circumstances.

It is especially interesting to notice, in studying the individual scores, that in all the schools, but especially in those schools where the retardation is highest, there appears an occasional retard who tests at the head, or nearly at the head, of his class. These children are usually found to be of the sort described by their teachers as "bright enough about some things" but unable to learn arithmetic, or reading, or spelling, or some other formal phase of school work. As you have probably noticed, the Primer Scale does not involve any formal knowledge on the part of the child. The examination is based instead upon observation of the happenings of everyday life. That certain children who are retarded in school do extremely well on such an examination raises some rather fundamental questions regarding the school curriculum. It may be that these children are essentially "misfits". But is it not quite as possible that the school is to blame? A curriculum based largely on the "three R's" may not be the curriculum which is best fitted to the special abilities and aptitudes of these children. They are evidently slow in mastering the formal elements of language and numbers; but yet in matters of everyday experience they show a more than average amount of "common sense". It would seem not impossible that a better adaptation on the part of the school to the special needs of such cases might result in their rising from the group of chronic failures and doing *some* kind of work well—at least well enough to maintain their self-respect.

So much for the results we have obtained with the Primer Scale. In the brief moment which remains to me I wish to point out certain important general characteristics of the scale itself. It is composed of four tests which present, *without the use of either words or numbers* (that is, without requiring of the child any literacy whatever) a total of one hundred problems involving sense perception, general information, ideation, mechanical ingenuity, reasoning, and judgment. The scale takes about twenty minutes to give. When we tested Bloomington last week my husband and I began to test when school opened at 8:30. We continued examining until 2:30 (not testing, of course, during recess periods or at noon). When we stopped we had examined all the first-, second-, and third-grade children in Bloomington—a total of over six hundred cases. At 2:30, two of the students and I started scoring the papers. At 6:00 p.m. all the papers were scored. The complete survey was, then, made by two examiners and scored by three people in only one day. The convenience of the scale for the ready measurement of groups would seem evident.

There is one other feature of the test structure upon which I should like to comment. The four tests are all based upon the "Cross-out" principle—that is, in each test the child is asked to cross out an extra or wrong element in the situation. This method involves a minimum of labor on the part of the child. It also permits directions which are short and uniform thruout the test, thus avoiding the fatigue which small children show very quickly if they are shifted constantly from one problem to another, and if each test has a distinct and special set of directions. The naturalness of the problem from the child's point of view should also be noticed; he is asked to cross out something that is wrong or extra. When a child makes a wrong or extra mark on his paper he immediately crosses it out. One task of the primary school teacher is to make him abandon this method in favor of an eraser. On the mechanical side, the scale is thus distinguished by the naturalness of the recording act which it requires of the child; and with this naturalness there go also unusual ease in giving and readiness in scoring.

The paper may be briefly summarized. The Primer Scale is a group scale of intelligence, for use in the first, second, and third grades, but intended especially for the measurement of the raw "pupil material" as it first comes to the schools in the entering classes. The scale has thus far been given to a total of about 1,200 children—all the pupils in the first, second, and third grades of two small Indiana cities. It was found that the children entering the different ward schools within a given city may be markedly different as regards both general average of intelligence and range of ability. The children entering one school may test as high as a year in "mental age" above the children (of the same chronological age) entering another school of the same city. Or, the range of ability in the entering class in one school may be half again as great as the similar range in another school of the same system. In the one case it is suggested that, if the second school is to be of the greatest possible service to the inferior pupils who attend it, there should be special adaptations, in curriculum and methods, to the problems presented by this inferiority. In the other case it is urged that the first school should make some special provision for its large number of a-typical (extremely brilliant *and* extremely dull) children. But the point I have tried to emphasize is this, that before a school can either clearly understand its problems or wisely meet them it must first obtain some measure of the "material" it has to work with—must determine the inherent possibilities of its children.

Two other uses of the test results are also suggested. In schools where the classes are divided into "strong" and "weak" sections the findings may assist the teachers in making these divisions more satisfactory. And the scale may help in individual diagnosis; these last two uses are, of course, related. But it is stated that while the reliability of the scale in the individual case would seem fair, the chief value of the scale should appear in the making of group comparisons rather than in individual diagnosis.

And let me urge for the last time that some measure of the "pupil material" with which a school works must be obtained before that school can either decide wisely upon methods or judge fairly of results. Once this knowledge of "pupil material" has been gained the school can begin, with intelligence and understanding, to make adjustments to its problems. It is with such adjustments that my husband's paper, which follows this, has to deal.

School Surveys by Means of Group Tests of Intelligence

SIDNEY L. PRESSEY, Research Assistant in Psychology, Indiana University

A YEAR ago we presented to you a somewhat elaborate group scale of intelligence, which we considered to be of a very considerable reliability in the individual case, and which we attempted to make particularly adaptable by special methods in giving the directions and by an unusual variety of problem and method for work with grade school children. You may be interested to know that the scale has aroused not a little interest and that it has been used extensively both in practical educational work and in research. This scale was used by us shortly after the Conference last year in some rather extensive school survey work here in the state, and certain results of these surveys were—to us at any rate—very surprising.

They suggested to us that there might be in educational work a distinct place for two types of group scale of intelligence. One type of scale should, like the scale we presented to you last spring, be organized primarily for the purpose of obtaining reliable ratings on the individual case—primarily for individual diagnosis. But there also seemed to be a distinct place for a brief group scale, in form especially designed for convenience and standardization in giving and readiness in scoring, to be used for *group* comparisons. We have already mentioned this at the demonstration, but I am anxious to bring the point up again, because this notion of the use of a scale of *intelligence* for group comparisons is, so far as I know, distinctly unique in educational work. We found in these group comparisons last spring distinct differences between the children in different neighborhoods or communities, in mental endowment. Still more striking were the mass differences between different schools and school systems in the ways they dealt with the problems presented by these differences in ability among their school children. The results have been summarized briefly in a recent article of mine in *Educational Administration and Supervision* which some of you have doubtless seen, and need not be detailed here.[1]

They gave us our cue for our work this year. We have attempted, this year, to develop two brief group scales designed primarily for the measurement of groups. One of these scales has been planned for use with first- and second-grade children—that is, for use with the children as they enter the school. Our results along this line have just been presented to you by my wife. Her scale has been designed primarily to give a measure of differences in "pupil material" as that material comes to the school. The scale I gave you at the beginning of the afternoon was designed primarily for a different purpose—for the measurement of the adaptation which the school shows, in the later grades, to the problems presented by its "pupil material" and the individual differences which it finds among its children. And I wish briefly to illustrate to you three ways in which it seems to me such a scale may be of value in educational work. I shall present to you three groups of facts. The first will indicate something of the adaptation found in a single school, as measured by these tests. The second group of facts will deal with problems of inter-adjustment in different schools in the same system. And the third set of facts will have to do with differences between different school systems in their methods of adjustment. Most, tho not all, of these results have been obtained with the "Cross-out" Tests. But that does not matter now. The question is as to what uses *any* such scale of intelligence might serve in educational investigation.

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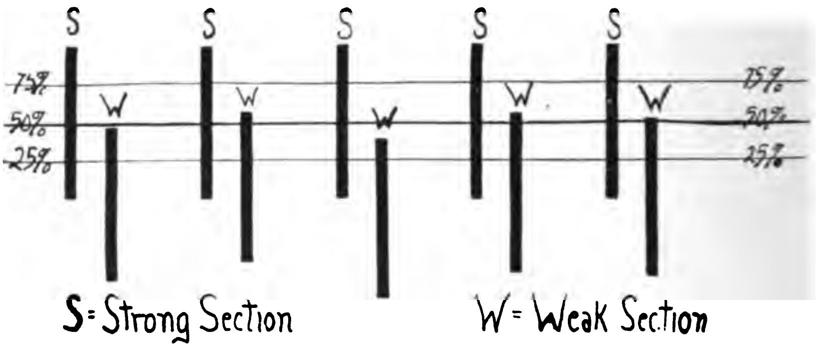
[1] "A Comparison of Two Cities and Their School Systems by Means of a Group Scale of Intelligence." *Educational Administration and Supervision*, Vol. V, No. 2, February, 1919.

First as to evidences which have been obtained, by the use of such a group scale, regarding the adequacy of adjustment to individual differences in mental endowment within a given school. To put the matter in another way, what might a principal hope to obtain by a survey of his school with such tests? Such a principal might find his scores most useful if he should tabulate them taking account of age-grade status. His median scores at each grade are much less important; they are determined by factors largely not under his control, like the average mental endowment of the children in the neighborhood from which his school draws. But it is important for him to know whether he selects his children accurately for whatever standard he may have, and whether the children in each class are sufficiently alike in ability to make a convenient teaching unit. I am sure that you will all agree with me that excessive retardation is unfortunate, and that no child should be kept in a grade below that in which he is capable of accomplishing the work required. We have put the matter something like this: suppose a child is retarded but tests above the median for the grade he is in. Would it not be well to stretch a point in such a case and see whether he might not do passably in a grade above the one he is now in, among children more his fellows? Not that the ratings obtained with this scale need be considered sufficient evidence for advancing that particular boy, you understand. But by the number of retards testing above the median for the grade in which they are placed we should obtain some measure of the extent to which retardation is consciously worked against, and the problem of adequate placement satisfactorily solved. It is hardly possible to present the facts in the graphic form I have tried to make use of in showing our other data. But I may say shortly that School A (as we will call it) shows 30 retards above the medians for their grades, and another school in the same system shows 15. School A shows 5 retards above the median for the grade next above theirs; School B shows only 1 such case. May I suggest that there would appear to be an excessive amount of retardation in School A (there is just that) and that the retardation has been somewhat indiscriminate? You may also be interested to know that the grade distributions for School A are 28 per cent wider than for School B. That is, School A not only retards more, but selects less accurately, as well, for its grades. May I suggest that definite action on the part of the principal of School A to make his grade adjustments more accurate is—at least—suggested.

But such matters of adjusting school work to the capacity of a child come to explicit recognition most fully in junior high school. And here I want to present very briefly indeed and schematically our results with the "Cross-out" Tests from the junior high school of another small Indiana city. This chart (Figure 1) shows girls' sections for grades from 6 to 8 inclusive—each half-grade except one having the girls divided into two sections on the basis of ability as estimated by the teachers.

Fig. 1. A Comparison of the Strong and Weak Sections in a Junior High School (Grades 6B–8A).



The comparison is made on the basis of the strong section, the weak section being shown as so much in per cent above or below the median of the corresponding strong section.

I wish you would notice in the first place that the groups are distinct thruout. This is, the tests evidently measure, to a very considerable extent at least, that sort of mental ability which makes a child bright enough for a good section or so inadequate in school work that he must be put into a slow section. But there is very considerable overlapping. That overlapping is most considerable in the 6A and 7A grades. Would it not seem plausible to use such a scale as a means of measuring the satisfactoriness of such division? It is not that the scale would necessarily indicate *which* children should be transferred (altho personally I am inclined to believe it is sufficiently reliable to aid in such a selection). But it would certainly give a means enabling a principal to compare sectional divisions, and to diagnose weak points in the total system—means of readjustment might be suggested by other methods.

I thought of calling this paper "The Group Scale of Intelligence in Educational Supervision". That it might find some service in supervision I have tried to indicate by this second chart (in lower half of Figure 1 of the preceding paper). City A and City B have junior high schools for the grades from 6 to 8. Each city has three ward schools. You see here indicated by these black lines the distribution of abilities in the fifth grades (the classes about to enter junior high school) in these three ward schools. You will see that in this first system the fifth-grade class in the poorest school shows only about 35 per cent above the median for the graduating class in the best school. In City B the worst school has only 30 per cent above the median for the same graduating class. Cities C and D have no junior high school, so we have compared eighth grades—the classes which will, in part at least, enter high school next year. We would expect that by the eighth grade there might have been sufficient time for the extra elimination and retardation usually found in poorer schools to operate sufficiently to make the graduating classes more alike. As a matter of fact we find our greatest difference here—only 20 per cent in the worst school above the median of the best school.[3]

Such differences, particularly in ward schools contributing to junior high school, are surely of sufficient importance to require study. And I should like to suggest that further work of this sort should be of not a little interest. You see here in this last city there is an example of a different problem: there is not only difference in average ability but difference in range of ability between the two schools. Such a difference would suggest a greater variety in the curriculum, or a greater flexibility in the organization, to take care of these differences. We have, as a matter of fact, made such school comparisons for entire schools from the second grade up. The farther down we go the more the differences are, in most instances. I have chosen the graduating classes because there, it seemed to me, the practical problem of adjustment became most acute, and the need of such measures most pressing.

I wish I could give you more data about these school differences. They are intensely interesting, and reflect, I believe, interesting sociological as well as educational conditions. But I am very anxious to describe also certain important features of the two-city comparison—an outline of which was published in the article I referred to a short time ago. To present the facts most simply we have prepared these two charts, with a mimeograph curve, which some of you have already obtained (Figure 2). You see that age for age the children of City A and City B are, in the mass, almost absolutely similar. They average alike, and there are about the same number of extreme cases. But grade for grade, the distributions are strikingly different. As an actual fact altho the children were of equal ability, the sixth and eighth grades in City B averaged above the seventh and ninth grades in City A! The explanation is complex, but the important causative factors were undoubtedly to be found in a retardation twice as great in the second city, a quarter as much acceleration—and the excessive elimination that usually goes along with such conditions. The children of the second city averaged grade for grade over five months older than in the first city. And there were over a third less children in the seventh and eighth grade in proportion to the third and fifth grades, than was the case in City A.

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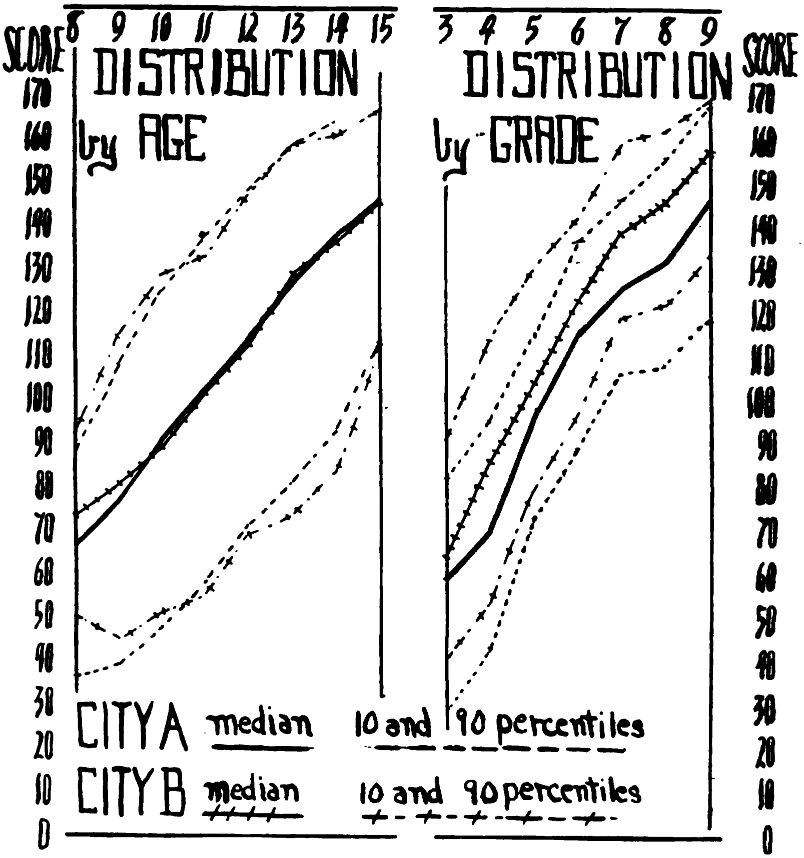
[3] Results from Cities C and D (shown on the original chart) are omitted.

The facts are surely striking. They suggest, it seems to me, something of a new approach to the old problems of retardation and grade adjustment. Not that a brief survey scale such as we have shown you will suggest individual readjustments to remedy such conditions (altho personally I believe it can be of great value in pointing out the children who had best be considered in making the adjustment). But such extensive surveys give us a large perspective on the situation which enables us to deal with such problems much more wisely than would be possible otherwise.

FIG. 2. A COMPARISON, BY AGE AND BY GRADE, OF THE ABILITIES OF THE SCHOOL CHILDREN IN TWO CITIES.



To summarize then. The contention is, that there is a distinct service to be performed in educational work by a brief group scale of intelligence designed especially for comparing sections, classes, schools, systems or other *groups* with regard to the average and distribution of ability in each group. We have found some evidence for supposing that such tests might be of use to a principal in making his grade and section divisions more accurate. They should assist a superintendent in standardizing conditions in the different schools of his system. They should aid both superintendent and principal by making possible comparisons between systems and cities, thus giving a larger perspective by which to judge local problems. Will you permit me now to say just a word about the particular brief scale with which we have experimented, as useful for such comparisons?

I must first emphasize again (we are so used to thinking of tests of general intelligence as tests useful only in individual diagnosis) that this brief scale of "Cross-out" Tests is designed for the making of *group* comparisons,—exactly as are the majority of our tests of achievement. For a scale to be used in such extensive testing as I have suggested, the utmost possible in economy of time and effort in giving and scoring, and in compactness and convenience of materials, is a first essential. Otherwise, such surveys are altogether impracticable. There must be, further, rigid standardization of method and absolute objectivity in scoring, since the tests will be given in most instances by the teachers themselves and often scored by them.

First, as regards ease in giving and scoring. The examination never takes over twenty-five minutes to give. The directions are sufficiently short to be all placed on one side of a typewritten sheet; they are not elaborate, and are to be read verbatim from this sheet (I may say that in our work thus far the examinations have been given largely by the teachers). Scoring is absolutely objective; either the right word or number is crossed out or it is not. There are no half scores, no ambiguous scores, no alternative scores. The scoring is so easy that it is possible to score an entire examination in one minute. That is, a teacher should be able to give the examination to an average-sized class, *and* score the results all within an hour. I wish to stress this convenience. There are few achievement tests which can be handled so readily. In their studied adaptation to your convenience, I believe these two scales which we have presented to you today are somewhat unique.

You will wonder if an examination so brief can be adequate for the purpose in hand. I wish to point out in this connection the extreme condensation of matter and problem we have introduced. An examination of one hundred items is presented on two sides of a 9 by 12 inch sheet. And the problems are absolutely clear cut; the possibility of chance successes is negligible. I am very anxious to invite comparisons on these points. By way of contrast in this matter I have placed on the table by the door sample copies of the army scale Alpha, of a group scale of intelligence recently devised by Arthur S. Otis, and of a modification of the army scale now being used by Professor Haggerty in the Virginia Survey. I think you will see at once how we have gained in compactness of form. The Virginia Commission presents practically the same number of problems on over three times as much paper; and there is involved, I should guess, at least twice as much labor in scoring.

Particularly have we obtained "condensation of problem". The first of the "Cross-out" Tests—the test of language ability—will serve as an example. Many of you have had experience with the Binet scale. You then know the form of "disarranged sentences" which appears in that scale. The child is shown three sentences with the words mixed up, and is asked to reconstruct the sentence orally. This is surely the most naïve form possible for such a test of language ability. The form requires individual testing. Timing is usually inexact, and directions loose. Finally there are no gradations in the score; the subject either passes the test or does not. An attempt to put the test in group form appears in the army scale Alpha. Here the subject is given a series of relatively simple disarranged sentences. Following each sentence are the words "true" and "false". The subject is told to figure out the sentence and then draw a line under "true" if the sentence is true or a line under "false" if the statement made by the sentence is false. For instance:

write are with to pencils..................true false
are and apples long thin....................true false

You will doubtless see at once that, in the first place, the matter which decides the subject's answer—the truth or falsity of the statement—is a matter beyond the understanding of the sentence itself. That is, we have a confusion of two things in the test,—ability to work word puzzles and judgment about certain common sense statements of fact. But altogether aside from this is the point that if you just guessed, you would get about half right by chance without ever solving the problem at all,—that is, half the blank is wasted.

Trabue has a different form of language test, with which you are undoubtedly familiar. He has ten sentences with certain words left out, and he allows the subjects seven minutes in which to fill in these missing words. After the words are all filled in, you know, if you have ever tried to score the Trabue completion scales, that a still worse task awaits the examiner. In this first test of the "Cross-outs" there are not ten but twenty-five sentences; yet the test is given in five minutes. It can be scored in less than fifteen seconds. And I am inclined to think that it will give, if anything, a more valuable measure of language ability.

We have tried to select these four tests as perhaps measuring some special ability of this sort besides being contributory to a total rating. The second might best be called a test of "information with understanding". I want you to notice that in each line there is a problem in fourfold similarity and fourfold difference. Those of you who are familiar with the Binet will again appreciate the great concentration of problem and condensation of matter as compared with the differences and similarities of that scale. About the remaining two tests I need say less. In the third we have hoped to find a test of potential arithmetical ability. The fourth is primarily a test of vocabulary and, in agreement with

Professor Terman's statement about his vocabulary test, we find it the most differential of the four.

This great condensation of problem is the most important single feature of the scale. Because of this condensation, and because of the very careful selection of tests which previous research has shown to be most highly differential of degrees of "general ability", we are able to present you with a group scale of "general intelligence" sufficiently convenient, and sufficiently standard in directions and objective in scoring, to make practically possible such extensive comparisons as I have suggested in the first part of my paper. The scale has now been given, in one form or another, to about four thousand cases. The items have twice been regraded and rearranged in the order of difficulty, and the form revised. The scale is by no means developed to the point I should like. But it will, I believe, serve very well the purpose I have had in mind—will prove an unusually convenient and ready method for first investigation of such problems of group comparison in the schools as I have outlined to you.

The question as to the particular merits of this particular scale of ours is, however, a comparatively minor matter. The matter I wish to stress is the importance of the problem for the further investigation of which we have planned these tests and the distinction between the use of tests of intelligence which I have suggested to you and the use to which you are accustomed. You are accustomed to the use of scales of intelligence for purposes of individual diagnosis. You have probably been amused at the somewhat ostentatious way in which I have avoided discussion as to the value of these group tests for that purpose. I believe they *can* be of use in helping to indicate the children who are misplaced in school. If John, who is a retard, does remarkably well on these tests that would surely suggest a reopening of his case, to discover whether somehow the teacher cannot reach him and obtain better work from him in the future. If Mary, who is in a slow section in junior high school, makes the best score in her section on these tests, that would suggest consideration of the question as to whether Mary might not be transferred to another section of her class. But with these matters of individual readjustment I am not concerned this afternoon. Instead I have tried to make the one point that if we are to understand the problems presented to the schools by the individual differences found among their pupils, or satisfactorily estimate the adjustments of the schools to these differences, we must first obtain a mass measurement of the amount of these differences and the extent of the adjustments. I believe there is a whole new field for investigation here, which has hardly as yet been opened. And I wish, if I can, to leave you with some sense of the importance of such work, and an interest in further investigations in this field.

Group Tests for Intelligence in the Bedford (Indiana) Schools

EMERY W. MONTGOMERY, Superintendent of Schools, Bedford, Indiana

AN Age-Grade Study was made in the Bedford schools in the fall of 1917 which showed considerable retardation and a very small amount of acceleration. Special coaching classes were organized to help remedy this condition, and the Binet-Simon Tests were used to select the pupils for these classes. We were anxious, however, for some adequate intelligence test that would answer the purpose and that would be much more practical. Therefore we were very glad to have Dr. and Mrs. Pressey come to us in the spring of 1918 and test 1,009 pupils ranging from the third to the ninth grade and a few selected from classes above that grade. This last winter they made another test of all our pupils, using one intelligence test from the fourth to the twelfth grade, inclusive, and a special test for the primary grades.

These tests showed a number of interesting facts. The tests of 1918 showed 75 children who were retarded in their age-grade standing but who made a rating in the intelligence test above the median for their ages. We also discovered 163 pupils from grades three to nine who, although retarded in school, gave intelligence ratings above the medians for their grades. Fifty-two retards showed a group test score above the grade in which they were actually placed. It was immediately seen of course that this was the cause of some of our elimination.

Another interesting situation was discovered. It was found that the children of one of the schools (School B we shall call it) averaged over a year in mental age below the children of School A. The retardation, however, was found to be only 8 per cent greater in the poorer school and the acceleration only about 5 per cent less. The better school had evidently not profited to the fullest extent from its higher mental age. The following figures will show that these group tests may be used to compare two schools as well as to compare individual pupils: in one school 216 children were tested and in the other 214 (from Grades 3 to 5 inclusive in both schools). School A draws most of its pupils from the best end of town. Forty-one per cent of the children in School A scored above the median for their school age, 8 per cent rated above the 90 percentile, and 12 per cent below the 10 percentile. School B draws most of its pupils from the poorer end of town. This school shows only 27 per cent of its pupils scoring above the age medians, 3 per cent scoring above the 90 percentile for their age, and 22 per cent scoring below the 10 percentile for their age.

The results of the tests given this year as between buildings are similar to the results of last year. School A again scored above the medians for all grades, while School B continued to score below the medians for all grades. We find, however, that there are more pupils in the normal age group thruout the school system, due to a conscious effort to lessen retardation.

We have made important uses of the results of this test. We have used the test as an aid in classifying pupils. When pupils were found who gave intelligence ratings above the medians for their grades we have made an effort to place them where they belong and thus lessen our retardation, increase our acceleration, and consequently reduce our elimination. We have not only done this in isolated cases, but Miss Dorothy Moran, principal of the junior high school, has used the test as a basis for the organization of opportunity classes for purposes of acceleration. Such a group was recently promoted to the high school and the pupils are doing excellent work. Coaching classes have been established and cadets are used to assist those who are seriously retarded. Use has also been made of the tests to determine accelerated and retarded groups in the grades and to assist in the introduction of supervised study in several rooms.

Mr. M. J. Abbett, principal of the high school, has made use of these group intelligence tests along with the Free Association, Analogy, and Trabue Language Tests of Columbia University to establish accelerated groups in algebra, language, and English classes in the high school. He has also used them to select pupils for accelerated work in the commercial department and to recommend that boys take shop work in some cases. He has made further use of them to help determine whether the pupil has language ability and whether he should drop or continue his language when failing. They have even been an aid in discipline by determining whether a pupil is doing all that he is capable of. I may say here that we have found a perfect parallel in the results obtained from Dr. Pressey's tests and those of Drs. Trabue and Briggs, of Columbia University.

We desire to thank Dr. Book and Dr. and Mrs. Pressey for their great assistance in this work, and I wish to state that much of the material discussed here is taken from Dr. Pressey's report which he sent to me after scoring and working over the tests. We are continuing our work on the results of the tests and we intend to make still greater use of them in the future.

Mental Defectives in the Rural Schools of County H in Relation to Their Physical Environment

HAZEL HANSFORD, Research Fellow in Psychology and Sociology, Indiana University

IN the years 1917 and 1918, the Indiana Committee on Mental Defectives made a survey of ten counties for the purpose of obtaining accurate information concerning mental defectives in Indiana for the state legislature. County H was made the subject of special study and it is concerning the schools of this county that I wish to speak.

County H is situated south of the central part of the state in a wooded hilly region. The central part is composed for the most part of good farming land. The outskirts are rough and hilly, unfit for the general farming of the only kind done by the average farmer. Besides being rough, these districts are, for the most part, isolated from the more civilized portions of the county. It is in these isolated rural schools tucked in among the hills and valleys that the largest per cent of feeble-minded and backward children were found. It was expected that in certain districts the number of defectives would be higher than in others but the amount of difference was not suspected. In one township it was found that 27 per cent of the school children were feeble-minded. This is probably a conservative number as the testing was done at a time when many of the children were not in school and it is a well-known fact that the dull children are the first to drop out of school.

When the results were studied according to schools it was found that the high per cent of this township, which we shall call Number 1, was due to the large number of defectives found in two schools in the township, and that those schools were located in two of the most backward and unprogressive communities in the whole county. There is not time to go into the social and economic history of each of the school districts which I wish to mention, but I will take time to describe briefly the conditions of School District A so that you may have a picture of what I have termed an "unprogressive community".

District A of Township 1 consists of a church, two stores, and perhaps a half-dozen houses scattered along the road. The schoolhouse is one mile north of the settlement. To reach this village from any direction, it is necessary to climb a long, steep, slippery, gullied, clay hill. The surrounding hills are covered with forests but this one is barren and bleak. The people try to farm but nothing seems to flourish. The whole place gives the impression of dilapidation, sordidness, and miserableness. Yet the inhabitants are not really miserable—they are stolidly indifferent to their lack of comfort and beauty. All the houses are log cabins or small box shacks. Some of them have partially fallen down. In others only one room is floored. They are all miserably cold in winter and have no protection from the heat in summer. In a number of the homes in this district, the field worker found chickens in the house with the family. One woman in particular is remembered as being seemingly unaware that it was an unusual thing for a hen to lay her egg on the family bed. The only comment made by her was that the hen laid in the same place every day. Dirty, listless children were everywhere. They did not seem to care to play either at home or at school. The women moved about in the same "don't care" fashion as did the children. They spent most of their time going from house to house with the latest gossip, never allowing their household duties to interfere with their leisure. The only clean house on the hill belonged to a widow who has spent most of her life elsewhere.

The schoolhouse was a dilapidated old building, one corner of which had been propped up to keep it from toppling. The school was taught by an old man said to have had no license who was filling out the unexpired term of a young lady who had given it up as a bad job. He was teaching the younger children to count to a hundred and to repeat the alphabet. After six months' practice some of the pupils were quite proficient in this task. In this class were a few children who had been in school several years without being promoted and these boys seemed to know their lessons no better than did those who were spending their first year in school. This old teacher spent no little time of the two days informing the field worker and the pupils of how he had "thrashed" boys worse than the present school held and how he could do it again.

The children present were tested by the Stanford Revised Scale. Out of the 19 children, 15 were feeble-minded. This at first thought seems incredible. The remaining 4 were average children, but compared with the rest of the school they were shining lights. Two of them belonged to the widow mentioned before as being the one good housekeeper in the settlement. There was a total enrollment of 37 pupils but the attendance was very irregular. According to the teacher, some of the pupils had been out all year. It seems that the attendance office had not yet penetrated Township 1. Not only were there a large number of children found to be feeble-minded, but there were none found who were more than average in intelligence. One child had an intelligence quotient of 96 and the others were all in the seventies. Where stock is uniformly inferior as in this place, it looks like an up-hill job for any school teacher.

Only one other school in this township is anywhere nearly so bad as School A and that is School B. In B, out of 12 tested, 6 are feeble-minded. The other 6 are not even average, 5 of them having intelligence quotients in seventy and one in eighty. There was an enrollment of 25, but, as in the other school, attendance was irregular. The general tone of this school was higher than that of School A as the children were all fairly clean and the dull, apathetic look common to the first school was not present in School B.

Another school where there is a large number of feeble-minded and backward children is School X of Township 2. This school is in a small, rough section of the township which was early settled by the common ancestor of almost every family now living in the community. There were 14 children in School X and of that number, 11 were tested. Six of these were feeble-minded and 4 were borderline.

In School Y of this same township is to be found another large group of mental defectives. Twelve out of 18 were tested and 6 of that 12 were decidedly feeble-minded.

In School M of Township 5 are to be found 5 defectives out of a total of 22 pupils. This school like the others mentioned is located in a rough, unfertile district where ambitious folks would not care to live.

There is another group of schools which for lack of time cannot be discussed here where the per cent of defectives is very small. These are all located in the midst of fertile farming country. In these districts practically all of the defective children are the offspring of farm tenants showing bad family histories. In Township 3, only 1 feeble-minded child was found in the schools and he had strayed in from a degenerate group in a neighboring township.

In looking for the cause of the large number of mental defectives in some of the schools it was found that often not only were the children closely related, thus receiving an inferior mental inheritance from the same source, but that many of the defectives in one school were related to the defectives in the adjoining school district. For example, the Johnson settlement is midway between Schools A and B of Township 1, School M of Township 5, and School R of Township 4. In each of these schools are to be found descendants of "old man" Johnson who originally settled there. Three of them who attend School A, 3 in B, 3 in School M, 2 in School R of Township 4, and 2 in School E of Township 9 are feeble-minded. Besides these there are a number of others who cannot be said to be feeble-minded but who have intelligence quotients somewhere in seventy. Among those who are feeble-minded, there is 1 intelligence quotient of 42, 5 somewhere in fifty, and 4 in sixty. Thus among the young descendants of the Johnson family are 11 defectives of whom we know besides a large number who probably carry an inferior heredity which they will transmit to the next generation.

The 6 feeble-minded children in School X of Township 2 are cousins related to a large group of epileptic, insane, and feeble-minded persons all of whom are the descendants of a John Allen. He came into County H in the early days and settled on Ripple Creek among the hills while his neighbors, whose descendants are now among the leading citizens of the county, took up the fertile farming land. Here, as in other cases, the inferior stock has not only been pushed into the hills early in the history of the county, but it has been kept there by the more complex environment on the outside. In this little community, this one family has intermarried with two or three other families who have also been pushed back out of the fertile farming lands until at the present time practically all the residents of this bit of rough land are related by blood ties and we find their children making up the list of mental defectives in the district school.

If there were time it would be possible to take every unprogressive isolated district and show that there has been practically the same population history as shown in the above brief family sketches. An Indiana University study which deals more fully with the mental defectives of County H and their problems will be published this year. In it, evidence has been produced to indicate that at least three things have had something to do with the great amount of mental defect in the rough rural district. (1) It is probably true that in the districts described the stock has always been inferior and in many places this is an established fact. The more enterprising settlers took up the best land and the inferior men who did manage to procure good farms were soon pushed back into the hills where competition was not so keen. Just how this was accomplished is shown in the study of the family histories of not only degenerate groups but also by the study of the histories of well-to-do families and of the part played by each in the development of the community life. (2) It is well known that individuals tend to marry in their own class, and as the years have passed the inferior families pushed back among the hills have intermarried until at the present time many of the residents of any one of these small communities can trace their ancestry to the same man. Thus, there is a bringing together of bad traits in the present generation which were serious enough many years ago to set the possessors of them apart from their neighbors. (3) There has for many years been a constant draining off of the most ambitious blood from the country to the city where there are to be had greater advantages. Consequently, the more inferior stock left behind tends to inbreed, producing more inferior individuals out of which number the best in their turn tend to move to the cities.

Some Experiments with Mental Tests as an Aid in the Selection and Placement of Clerical Workers in a Large Factory

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Introduction. Three types of tests have been used in the selection of applicants: trade tests, general intelligence tests, and tests for special abilities.

Trade tests as used by the army are so well known as to require no description. They aim to discover whether an applicant is skilled, semi-skilled, or merely a beginner in any particular trade.

General intelligence tests are measures of certain general abilities which are supposed to function to some considerable extent in many lines of work. They are often called tests of memory, attention, observation, etc. Their use is based upon the assumption that there is a "general intelligence" which will aid its fortunate possessor to succeed in almost any line of work he may undertake. Given this magic endowment he may hope to become doctor or lawyer, banker or engineer, dependent only upon choice, chance, and early training. How far this assumption is true it is not easy to investigate. Many pages have been covered with arguments pro and con. It is like trying to prove whether the patient died because of the doctor's medicine or in spite of it.

Tests for special ability assume that there are some particular qualities which aid the salesman to sell, other qualities which enable the lawyer to win his cases, still others which help the architect to design bridges; that while there may be such a thing as general intelligence which would aid a man in any of these professions, yet the man who climbs up out of mediocrity does so not by an excess of general intelligence, but by virtue of certain special aptitudes which function in his particular profession.

The trade test answers the question, Is he a skilled mechanic? The general intelligence tests asks, Has he the intelligence usually possessed by skilled mechanics? The special ability tests seek to discover whether the applicant is endowed with those natural gifts without which he can scarcely hope to become a first-class mechanic. Trade tests can be used only on men who have worked as mechanics at the trade. The other tests can be applied to men who have never tried that kind of work. How much money is being wasted in trying to make surgeons out of men who should be blacksmiths, or accountants out of men who should be carpenters, who can estimate? Certainly it is high time the employer and the educator attacked the problem of placement and vocational guidance with all the tools that science has made available.

Two Methods of Attack. For the investigator who wishes to obtain a set of tests for any particular task, two points of departure are possible. He may start with the simple mental tests, covering as wide a range as possible, in the hope that some few in the set may by good fortune show correlation with the required task. Scott's tests for salesmen were built in this way. The process is often long drawn out, and disappointments are many.

The second point of departure is an analysis of the task itself. Each operation is reduced to its simplest factors, and these are standardized into tests. Such a sampling process was used by Münsterberg in his tests for motormen and ship captains. It was also followed in the army tests for truck-drivers.

By whichever method the tests are obtained, the ultimate measure of their value must be their correlation with final performance in business. But it often requires weeks to determine a man's value on the job. If at the end of that time the tests show no correlation, much time has been lost. It is therefore desirable to use as extensive a preliminary set of tests as possible, more time being given than would be practicable in the final series. Certain preliminary checks can be made to eliminate tests that give little promise of value.

Scott suggests that persons now on the job, whose ability is known, be measured by the tests. With the general tests this is often useful. With samplings of the task the performance of one who has worked six months may be no indication of what he would have done before he learned the work.

Another preliminary check is the retesting of the same group of new people after a few days, using the same or equivalent tests. If there is no serious displacement in rank it may be assumed that the first test is an indication of ultimate performance. If the correlation between the two trials is low it is possible that a first test is of little value, unless the test itself has been vitiated by the repetition.

General Intelligence Tests Tried. When it was decided to try mental tests to aid in the selection of clerical workers in a large factory in Chicago, twenty-five new clerks were chosen by the old interview method, for the experiment. This group met three times a week for class instruction. At the beginning of each class period one or two of the following tests were given to the class:

Courtis—Arithmetic, Series A
Kelly—Silent Reading
Starch—Arithmetic Scale
Ayres—Spelling Scale
Ayres—Handwriting Scale
Thorndike—Handwriting Scale
Trabue—Language Completion Tests A, C, and K
Scott—Reading Figures
Scott—Proverbs
Woodworth-Wells—Easy Opposites
Woodworth-Wells—Difficult Opposites
Woodworth-Wells—Verb-object

Woodworth-Wells—Mixed Relations
Woodworth-Wells—Difficult Directions
Cancellation of Letters
Substitution of Digits for Geometric Figures
Terman-Binet Tests for Ages 10-12-14-16-18
Healey 5-block Puzzle
Münsterberg—Observation (numbers in rotation)

At the end of four months, and again at the end of six, nine, twelve, and eighteen months, an attempt was made to measure the efficiency of the graduates as actual time-clerks. Several indices were used, and the average of these taken as the true measure of ability.

It remained to determine what correlation existed between scores on the various mental tests and this index of shop success. Tests with correlations below .4 were discarded, those between .4 and .6 were considered for second trials, and those above .6 were regarded satisfactory. Most of the tests fell in the first class, a few came above .4, and almost none above .6.

Meanwhile experienced shop time-clerks were tested, but without obtaining many encouraging correlations.

On the other hand, intercorrelations were in some cases high, which indicated that the tests were reliable measures of some ability, if not of that required for time-clerks.

Job Analysis and Sampling Tried. Following the failure of the synthetic method to discover any valuable tests, an analysis of the time-clerks' task was made, to discover what factors contributed to success. A superficial study revealed the following desiderata:

1. Speed and accuracy in adding hours worked on various jobs each day in the week.
2. Speed and accuracy in computing elapsed time between time started and time finished on a job.
3. Speed and accuracy in copying data from one record to another.
4. Legibility and neatness of records.

Errors in these operations were so frequent as to require one investigator to correct the work of each ten time-clerks. It was evident, therefore, that accuracy was of first importance; and yet with two million tickets to be handled a week, speed could not be ignored.

Inspired by the Courtis drill problems, two sheets were designed, one calling for addition of time, the other for subtraction of time[1], in exactly the form required by the time tickets. These were used four minutes a day for twenty-five repetitions, and first and last scores correlated with shop success. Their value for the selection of time-clerks can be seen from results. The class was divided into quarters by scores on first tests. Shop reports six months later showed:

Best quarter—
- 2 head clerks
- 3 excellent time-clerks
- 1 good time-clerk

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[1] These tests are reproduced on pp. 63, 64.

Second quarter—
- 2 head clerks
- 1 excellent time-clerk
- 1 good time-clerk
- 1 fair time-clerk

Speed..............in Four Minutes TEST No. 2 Name..................................

Errors.............. Date.............................191...

ADDITION OF LABOR HOURS

Mon.	Tue.	Wed.	Thu.	Fri.	Sat.	Total	Mon.	Tue.	Wed.	Thu.	Fri.	Sat.	Total
8¼	8½	11¾	8¾	8¾	4¼		8¾	8	8¾	10¼	8½	4¼	
3½	8¾	11	3¼	8¾	4¼		8	6¼	8¾	8½	11	3½	
10¼	1¼	10¼	5½	5¾	3¼		8¾	7½	8¾	5	8½	3¼	
7	6	6¾	6¾	8½	4¼		8¾	7	10½	7¼	8¾	4¼	
8¾	6¼	5½	5¼	8¾	4¼		6¼	8½	8¾	8¾	6	4¼	
8¾	4½	8¾	6¾	10¼	4¼		8¼	8½	3¾	5½	4	3¾	
8¾	8½	7¼	8¼	6	4¼		8½	6¾	6	6½	6¾	4	
7	8¼	8¾	8½	4½	4½		8¾	4	5¼	7	10¼	4¼	
7½	3½	8¾	8½	10¾	4¼		8¾	5½	8¾	6¾	11	3½	
6¼	10¾	8¾	10¼	4½	3½		8½	8¼	7	8¾	11¾	4¼	
8¾	6¼	8¾	7¼	6	3¾		8¼	8¾	10¼	6¾	8¾	4¼	
8	7½	10½	8¾	4	4¼		8¾	4½	7¼	8½	10¾	3½	
8¾	7	8¾	8½	6¾	4¼		7½	9¼	6¾	5¼	10¼	4¼	
8¾	8½	8¾	6½	10¼	3½		8¾	8¼	8¾	10¼	8¾	4¼	
6¼	8½	9	7½	11¼	4¼		10¼	6	8½	6¾	8	4¼	
8¼	6¾	5¼	6¾	11¾	4¼		7	3½	8¾	8¾	8¾	3¼	
8½	4	8¾	8¾	8½	3½		9	6¼	8¾	8¼	4½	4¼	
8¾	5½	7	10¼	8½	3¼		7½	10¾	11¾	8¼	5¾	4¼	
8½	8	8¾	5	8¾	4¼		8¾	4½	7¼	8½	4½	4¼	
8¾	8¼	8¾	8½	8½	4¼		6¼	8½	11	5½	8½	4¼	

Speed..............**in Four Minutes** TEST No. 3 **Name**...... ....

Errors.............. **Date**...........................**191**..

ELAPSED TIME

Started	Finished	Hours	Started	Finished	Hours	Started	Finished	Hours
7:30	11:15		7:30	10:00		7:30	11:00	
11:15	2:45		10:00	5:00		11:00	2:00	
2:45	5:00		7:30	9:45		2:00	4:15	
7:30	10:15		9:45	11:00		4:15	5:00	
10:15	5:00		11:00	4:00		7:30	4:15	
7:30	3:45		7:30	5:00		9:15	12:00	
3:45	5:00		7:45	10:30		12:45	3:00	
7:30	11:00		10:30	3:15		8:00	5:00	
11:00	3:15		3:15	5:00		7:30	4:15	
3:15	5:00		7:30	3:00		4:15	5:00	

7:30	10:45		7:30	11:00		7:30	5:00	
10:45	2:00		11:00	2:15		7:30	10:15	
2:00	3:45		2:15	5:00		10:15	5:00	
3:45	5:00		7:30	12:00		7:30	9:45	
7:30	5:00		12:45	3:30		9:45	5:00	
7:30	10:30		3:30	5:00		7:30	9:15	
10:30	3:15		7:30	2:45		9:15	3:30	
3:15	5:00		2:45	5:00		3:30	5:00	
7:30	8:45		7:30	3:15		7:30	8:15	
8:45	5:00		3:15	5:00		8:15	3:00	

Third quarter—
- 2 very slow time-clerks
- 4 dismissed because slow and inaccurate

Fourth quarter—
- All had been dismissed except one, who was transferred to trucking.

Each test was scored for speed and accuracy separately. No combined score for both has proved satisfactory. The correlation between speed and accuracy can be seen from the following data:

Accuracy of Groups Selected by Scores in Speed

Best quarter	Average accuracy	.985
2d quarter	Average accuracy	.86
3d quarter	Average accuracy	.71
4th quarter	Average accuracy	.66

The extent to which each group improves with practice is shown by the average performance of each group on first and twenty-fourth repetitions of the test.

Improvement with Practice

	1st trial	24th trial
Best	23	42
2d	13	25
3d	6	15
4th	4	8

Each group after four months' drill barely attained the score possessed at the beginning by the group above. The best individual score was 50. While there was a slight displacement in rank between the first and last trials, two-thirds of the men finished in the same group they started in, and the rest moved up or down only one step, which would seem to indicate that the first trial was a fair measure of ultimate performance.

The failure of the Starch Arithmetic Test to select time-clerks points to some special ability required in computing time which could not be predicted from success in ordinary arithmetic problems, just as Courtis long ago demonstrated that ability in addition could not be taken as a measure of excellence in subtraction.

Nervousness of Applicants. Every discussion of tests for the selection of workers brings up the questions, Will not the fear of losing the job cause a nervousness which will vitiate the results of the test? And will not the average applicant be unwilling to submit to the tests?

Of course much depends upon the personality of the interviewer, and upon the way the tests are given. The use of the four arithmetic fundamentals as introductory tests served to set the applicant at his ease. The problems are so simple that he soon loses any nervous self-consciousness, but plows along with the feeling that he is master of the situation. It is often really amusing to see the self-satisfaction of an applicant whose performance is less than half the standard, but who feels he has done well because he is so sure his answers are *right!* The next two tests (addition and subtraction of time) require considerable effort, but they are followed by the Opposites and Copy Tests, which put him at ease once more so that he attacks the more difficult tests which follow with confidence. It is largely because of their value in giving the subject a favorable start that the Courtis A Series has been retained in preference to later and perhaps more reliable measures of arithmetic ability.

Nervousness that was only temporary would disappear after several days of repeated testing. It would have been readily detected by the sharp ascent of the learning curve. Yet out of over a hundred persons observed during several weeks of testing, not more than five or six cases of stage-fright were noticed. Nervousness that was characteristic of the person at all times would interfere with business relations as well as with tests. Therefore, it is believed nervousness cannot be urged as a serious objection to selection by tests.

The applicant's attitude toward the tests is determined in large part by the interviewer. When it is explained that several positions are open, requiring special abilities of various sorts, and that it is the purpose of the tests to discover in which line the applicant is best fitted to succeed, he accepts them in the spirit in which they are really intended, not as *fault* finding, but searching for particular *abilities* which will make a valuable employee, and which cannot be discovered in any other way. Presented in this manner it is not often that an applicant shows any resentment.

A Modified Opposites Test. A time-clerk must not only be accurate, but he must also be rapid, and his speed in the arithmetic processes was only one factor.

A survey of the shop discovered some clerks writing 50 per cent more tickets than others, working under identical conditions. An analysis revealed two factors governing the volume of output: speed of handwriting and speed of making simple decisions. To measure speed in handwriting was not difficult. The next task was to find a measure of the hesitation factor.

The first test tried was the simple opposites. Given in the standard way it was open to two objections. Being oral, it required individual testing in a private room, whereas it was the aim to develop tests which could be given to a whole group at one time in the classroom. Moreover, the shop clerk is making written rather than oral responses in his regular work, so the test should likewise require written responses. The standard procedure was therefore altered to require written answers. This, of course, introduced another variable—speed of handwriting. To remove this from the equation the subject was given a second test in which he was required to copy the same words which he had just written as opposites. The significant score then was the *difference in time* between that required to write opposites and that to copy the same words.

What is really measured by this test is probably the ability to look ahead to the next operation while completing the preceding one. With more intelligent subjects there is no hesitation between words. With less intelligent ones the task of writing seems to occupy the entire attention so that the mind is not free to think of the next opposite until the last *t* of the preceding word has been crossed and the *i* dotted. And there seems to be no correlation (-.10, Spearman) between this necessity for attention to the task of writing and the speed with which the writing is done. It is equally required by those who write slowly and by those who write rapidly.

A rather surprising correlation was discovered by one of the examiners, who noticed that the higher the school grade of the subject the better his score. The median retardation factor for eighth-grade graduates was 45 seconds, for those who had gone two years to high school, 32 seconds, and for high-school graduates, 24 seconds.

Correlation between scores on this test and success in the shop may be seen in the average wage increase granted to members of the four groups during a year's service.

Group	*Retardation*	*Average Increase*
Highest quarter	less than 20 seconds	$3.42
Second quarter	20–30 seconds	2.97
Third quarter	30–50 seconds	2.24
Poorest quarter	over 50 seconds	1.61

In other words, the applicant starting at, say, $15 a week, who tested above the upper quartile would be receiving $18.42 at the end of a year, while his neighbor starting at the same rate but testing below the lower quartile would be receiving only $16.61 at a year later, if he was so fortunate as to hold his job that long, which was improbable. Of those who started in the poorest group only 17 per cent survived a year, while from the upper quarter 70 per cent were still employed at the expiration of twelve months.

These two tests (written Opposites and Copying) requiring from a minute and a half to three minutes each, were added to the set.

The Difficult Directions Test. Besides speed and accuracy in arithmetic and in copying, another factor determined the value of the time-clerk, viz. his ability to make accurate quick decisions and to detect the *exceptions* in a mass of routine tickets. His instructions were complicated by countless "ifs". "If the employee works overtime, the overtime allowance must be written on a day-work ticket. But if he is employed regularly on special hours, no allowance ticket is required." "If he works on a piece-rate, use a ticket printed in red, but if he is repairing defectives use a day-work ticket printed in black on red paper." And so on indefinitely.

One clerk hesitates so long in making simple decisions that he is too slow. Another does not "stop to think", uses the wrong form, and causes the ticket to be mis-filed. Between these two extremes is the desirable man. To discover him the "Difficult Directions" test[3] was tried.

At first low correlations were obtained, but certain facts led to the belief that it was the method of scoring rather than the test itself which was at fault. Accordingly, a thousand tests were scored in three ways and correlated with shop success. One method of scoring gave an index of .81, and from that time on the test has been a valuable part of the set.

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[3] This Difficult Directions Test is reproduced on page 68 with the title "Follow Instructions", which was deemed more appropriate for the type of persons being tested.

TEST No. 11

Western Electric Company.
Incorporated
Clerical Training Department

Name............................
Date............191..Time.........
Errors........

FOLLOW INSTRUCTIONS

3 With your pencil make a dot over any one of these numbers, 2 4 6 8 9,

3 And a comma after the longest of these three words: BOY MOTHER GIRL

2 If Christmas comes in March, make a cross right here,———

6 But if not, pass along to the next question and tell where the sun rises—————

3 If you believe that Edison discovered America, cross out what you just wrote,

But if it was someone else, put the correct number in the next sentence:

2 "A horse has———feet"

5 Write "YES" no matter whether China is in Africa or not,——————

And then give a wrong answer to this question:

10 "How many days are there in the week?"————

1 Write any letter except "G" just after this comma,———

12 And then write "NO" if 2 times 5 are 10————

1 Now, if Tuesday comes after Monday, make two crosses here—————

5 But if not, make a circle here————or else a square here—————

5 Be sure to make three crosses between these two names of boys: GEORGE——————HENRY

Notice these two numbers: 3, 5. If iron is heavier than water,

6 Write the larger number,———

8 But if iron is lighter, write the smaller number———

11 Now show by a cross when the nights are longer: In summer?——— In winter?———

2 Give the correct answer to this question: "Does water run uphill?" ——————

3 And repeat your answer here——————

1 Do nothing here (5 ÷ 7 =) unless you skipped the preceding question, but write the first letter of your first name and the

11 last letter of your last name at the end of this line.

A year ago there was published a discussion of the Difficult Directions Test (Pintner and Toops in the *Journal of Educational Psychology*), scored according to Wooley's method. The conclusion was that the test was too easy for adults. The difficulty lay rather in the method of scoring than in the test itself. Judged by accuracy alone it is true that the test does not give a distribution of the best fifth of all persons tested, who make scores of 100 per cent. But when the *time* factor is taken into consideration this disadvantage disappears. A still further objection to the Wooley method is that proper allowance is not made for the varying difficulty of the questions. An analysis of a thousand papers showed 3 per cent failing on the easiest question, and twenty-eight per cent failing on the most difficult one. An accuracy score was adopted which was based upon the number out of the thousand who failed on each question. The time score was merely a separation into the four groups by the median and the quartiles.

The correlation between speed and accuracy was studied in the following manner. Using the quartiles as the dividing points, all papers were separated into nine groups:

A—Rapid accurate	9 per cent	
B—Rapid average	16	
C—Rapid inaccurate	0	
		25 per cent
D—Average accurate	13	
E—Average average	25	
F—Average inaccurate	13	
		51
G—Slow accurate	3	
H—Slow average	9	
I—Slow inaccurate	12	
		24
		100 per cent

If no correlating influence were at work, Groups A, C, G, and I should each include 6 per cent; B, D, F, and H 12½ per cent; and E 25 per cent. The fact that A and I are high, while C and G are low indicates the existence of a force which tends to make rapid people accurate, and slow people inaccurate. Another interesting fact is the excess in the rapid-average group at the expense of the slow-average group, but no corresponding drift toward excellence between Groups D and F. This can be seen best in the diagram below:

Accuracy

	A 9 per cent	B 16	C 0
Speed	D 13	E 25	F 13
	G 3	H 9	I 12

Expressed in indices of correlation (Product-moment formula) for the various groups:

A........	.972
B........	.099
C........	.——
D........	.087
E........	.214
F........	.774
G........	.——
H........	.129
I	.997
Total...	.325

Used as a basis for selection, then, to obtain ten clerks from group A would require the examination of 111 applicants. Sacrificing speed but still maintaining accuracy, 10 could be obtained from Groups A and D out of 45 applicants. Allowing half an hour to each applicant this would cost 2¼ hours for each clerk hired, which is excessive. Adding the applicants from Group B would reduce the total tested to 27 for 10 clerks, or less than 1½ hours for each clerk, and still obtain clerks decidedly above the average. If it is desired merely to eliminate the exceptionally poor groups, E could still be added, requiring 16 applicants to 10 clerks hired, at a cost of 48 minutes per clerk.

The value of such a selection of clerks is shown by the following table:

Group a..Best ¼ 10 clerks write 291 papers an hour, 97.5 per cent accurate.

Group b..Best ½ 10 clerks write 246 papers an hour, 90 per cent accurate.

Group c..Best ¾ 10 clerks write 214 papers an hour, 83.5 per cent accurate.

Group d..Unselected 10 clerks write 195 papers an hour, 80 per cent accurate.

1000 papers would cost 34.4 hours by Group a
1000 papers would cost 40.7 hours by Group b
1000 papers would cost 46.8 hours by Group c
1000 papers would cost 51.4 hours by Group d

if all papers were correct. Assuming that one error costs as much as ten papers (a very moderate estimate), then the cost per 1,000 papers would become

Group a........	35.3 hours
Group b........	44.8 hours
Group c........	54.5 hours
Group d........	61.7 hours

which is a saving per 1,000 papers of

Group a........	26.4 hours
Group b........	16.9 hours
Group c........	7.2 hours

Such a saving was actually experienced when selected shop clerks were substituted for untested clerks. In several departments two clerks were able to do the work formerly done by three, with a decided increase in accuracy.

Tests Must Indicate General as well as Special Ability. The modern employment manager is not satisfied when he has merely introduced the applicant to his first job in the organization. He feels that he must follow up this first placement by such transfers and promotions as are necessary to bring out all the best that the man is capable of attaining. To do less than this is not only unfair to the individual, it is also poor business. For nothing makes for a loyal force of enthusiastic workers so much as a vigorous educational and promotion program. The fact that those in high places have risen from the ranks is the strongest argument that there is a future for men of ability in the organization, and men of ability cannot be held long at any wage where they feel they are working in a blind alley.

Therefore, in a set of tests for shop clerks it is essential to introduce measures of general intelligence which will pick out the men in whom it is worth while to invest broad training with the hope that they can ultimately become understudies for executive positions. For while no correlation was discovered between general intelligence and success as routine time-clerks, considerable correlation appeared between general intelligence and success in positions of greater responsibility. Probably even a moron, if he possessed peculiar talent for that special work, might write time-tickets successfully. But the ability to organize work and to train subordinates requires intelligence which is readily recognizable thru tests.

Undoubtedly other tests might have been given, with equally good results. But it seemed wise to use standardized tests which conformed as nearly as possible to the task for which they were to select.

In a big organization most of the work of a minor executive consists in handling internal correspondence. Every fifteen minutes the mail boy drops another pile of memoranda into the "IN" basket. The department head must be able to comprehend these not-always-too-carefully-outlined requests and instructions, and make replies that the recipient can understand. Accordingly the Kansas Silent Reading Test and Trabue's Language Completion Tests were added. The Kansas Silent Reading Test was designed for school children, and its language in some cases might offend the dignity of the young men who were being tested, so slight changes were made in the wording to give it a business flavor. This modified test gave such high correlations with success on executive work (.77) that it has not been altered to conform with later revisions of the test.

Trabue's Test has two advantages. It not only gives a valuable index of general ability, correlating highly (.68) with success in responsible positions, but it also detects two undesirable types—one the man who jumps at conclusions and does not go back to check his work, the other the man who gives up too easily before obstacles. It is not safe to carry such inferences too far. Obviously it would be difficult to evaluate such a correlation numerically, but the number of persons sent back as unsatisfactory in these traits who showed the same characteristics in Trabue's Test is so large as to preclude the mere operation of chance. When confirmed by evidences of the same trait in the Difficult Directions and the Silent Reading Tests it may safely be accepted as a warning of a fault to be guarded against.

Form for Recording Test Scores. Where a number of applicants must be tested each day, it is essential that the scores be presented in such a form that they reveal at a glance the standing of the applicant. For this purpose a score-card was designed similar to that used by Kitson in his measurement of students at Chicago University. A vertical column is assigned to each test and all are divided horizontally by the 25 per cent and the 75 per cent lines. The actual score is written in its corresponding column at the proper height, which makes future statistical summaries easier than the lines used by Kitson. Such a score-card classifies the applicant as either superior, ordinary, or inferior. Finer subdivisions detract rather than add to the usefulness of the card. Executives soon learn to read the records, and often send for them when considering transfers or promotions. In some cases it was desirable to make a duplicate set for the executive's file.

Individual Cases. How the definite information furnished by tests can supplement the general impressions of the interview, the following individual cases may illustrate.

"M" was a graduate of the University of Chicago. That she possessed a keen mind no one who talked with her five minutes could doubt. An English college woman had just achieved wonders in the cost accounting department, and was calling for an assistant. "M" was given the job. Her first task was to learn to compute percentages on a slide-rule. After several days of patient effort her superior appealed for an exchange. "M" could not do the work. Still she was recommended as unusually intelligent, willing, with pleasing personality. She was sent to be tested. The results were extremely striking. Below the lower quartile in all arithmetic tests, she was almost without equal in the excellence of all other scores. A vacancy was created for her in a correspondence group, and in a short time she was head of the group, auditing all correspondence which went out and dictating many letters herself from technical data furnished by the engineers. By the use of tests in the beginning she might have been saved the discouragement of the first failure, which might under less favorable conditions have lost a valuable employee to the company.

"W" was a high school graduate, nineteen years old, who was promoted to a position where he was required to check the typewritten purchase-orders for tools against the engineer's longhand originals. He allowed an error to pass which cost the company several thousand dollars and kept the U.S. government waiting ten days longer for its equipment. Under the old régime he would have been discharged at once. Instead he was sent for test and placement. The tests showed him to be rapid but inaccurate. He was placed where speed was the main requirement, and where his errors could do no harm, and has proved highly satisfactory.

The Demoralizing Effect of Misplacement. The importance of proper placement as a saving to the employer is obvious. But the value to the individual worker must not be overlooked.

The demoralizing effect of failure can hardly be overstated. The man who gets into the wrong job deteriorates so rapidly that unless he is a strong man he is liable to be permanently dwarfed. Like the bad-fitting shoe, the bad-fitting job causes all manner of painful deformities. One has only to sit behind the application desk of an employment department for a few days to see its havoc written into the souls of men. Discouraged, disappointed, restless, stunted, they drift from job to job, their precious youth wasted as mere servants of the weekly pay-envelope, their children starting the race of life with the handicap of poverty upon them, they finally find a haven as janitor or elevator operator, from whence they who survive finally become society's pensioners. A dark picture, to which there is a brighter side, for if "weeds are but flowers for which man has not yet found a use" then failures are but workmen who have not yet found the right job. To find the right jobs for these failures is a task which has its own rewards.

"R" was such a failure. He was eighteen years old, and had been newsboy, telegraph messenger, delivery boy on a department store truck, "rustler" in an express office, and now finally stock-clerk in a big factory. With no definite aim, never satisfied nor satisfying, holding each job a few months, then hunting another, anything so long as it paid enough money, he was on the high road to becoming a chronic failure. Nothing had ever really aroused his interest. Fortunately, instead of being "fired" he was sent to be tested. The scores were interesting. Ability was there without doubt. But in what useful line? Terman-Binet tests showed a good normal adult, but in arithmetic he was low. (He left school because he could not master decimal fractions.) He thought he would like to be an electrician, so a job was found for him in a motor repair shop. Here he was fortunate in finding a sympathetic teacher who encouraged the boy to do his best. Soon he was given outside jobs. He showed a liking for climbing, so crane and elevator jobs were passed to him. Now he is an experienced motor maintenance man, with real money in his pay-envelope, and two years of steady service safely behind him. He has found his job.

"G" was another failure. He had been tried on various tasks, without success. Tests showed more than normal ability. Nineteen years old, he was still drawing the pay of an errand-boy. He had been a beginner for five years, and had "gone stale". It was decided to arouse his ambition by giving him a big promotion. He was made assistant to the clerk who ordered raw material from the blue-prints, at nearly twice his former wage. He entered evening classes in drafting and shop practice, and applied himself to his work with a will. In six months his whole personality was altered. He spoke with assurance, held his head up, walked as though he were going somewhere, and had in every way "made good".

The sense of accomplishment is one of the strongest incentives to drive a man to do his best work. It will arouse effort which no wage system ever can call forth. The schools are beginning to recognize the importance of this motive, and have in some instances remodeled their machinery so that the slower moving pupils can take three years to reach the goal their more rapid fellows reach in two. The slower pupils are thus saved the discouragement of a "not passed", and are trained for success rather than for failure; while the rapid pupils are spurred to effort comparable with their ability, and so saved from mediocrity.

Conclusions. 1. Highly specialized tasks may require particular ability which is discoverable only by tests designed for that purpose. For such tasks general intelligence tests are of little value. When tests for the special ability are perfected, the persons who are selected by these tests are much more efficient than unselected workers on the task, making it possible to accomplish more and better work with a smaller force.

2. General intelligence tests are increasingly useful, the higher in the organization scale they are applied. Their value is threefold: first, as a check upon special tests in the selection of applicants for primary tasks; second, as an indication of ability to ascend the ladder to more responsible positions, when promotions are to be made; third, to indicate whether failure on a particular task was due to lack of special ability for this work, but with promise of success in some other line, or whether it was caused by giving too much (or too little) responsibility.

3. Certain factors of success, which make up what is commonly called "personality", are not measurable by test, but must be judged by an interview. Selection cannot therefore be delegated to a routine clerk, but must always be made by a trained observer. There is danger that too sweeping inferences may be made from test data, which will be unfair to the applicant and to the employer.

4. The observer must be on the alert to detect evidences of ability or disability not discoverable by routine scoring of the tests.

5. The employment manager can be greatly aided in making placements if he can have access to the applicant's school record in terms of standard scales. To know the spelling and grammar ability of an applicant stenographer, to know the arithmetic ability of an applicant bookkeeper, would save much waste to the applicant and the employer.

6. By coöperating with the university psychologists, employers may save much time in designing tests and avoid the danger which follows when over-sanguine amateurs attempt to use tests whose significance they do not understand. Many so-called tests are being used at the present time in a way that can result only in injustice to the applicant and loss of valuable men to the employer. The Bureau of Salesmanship Research at Carnegie Institute of Technology is a notable example of what can be done when employer and university get together.

7. The employer who has once been so fortunate as to obtain and use a really scientific set of tests will never again be satisfied to pick his men by the haphazard impressions of an interview alone.

Intelligence Test of High School Seniors

OSCAR H. WILLIAMS, State High School Inspector

THE state-wide intelligence test just now commanding the attention of senior classes in Indiana high schools is perhaps the first attempt in the history of mental measurements to apply a test of general intelligence to a group extending over an entire state. The test employed is known as the Indiana University Intelligence Scale No. 1. The scale is a series of tests of general intelligence devised by Dr. and Mrs. Pressey under the guidance of Professor Book. They are derivatives of the Simon-Binet Tests of intelligence and are consequently based on the same general conception of the nature of intelligence as those well-known tests, viz. *that human intelligence consists of the sum total of the thought processes which constitute mental adaptation.* They are tests of native ability to combine ideas and adapt the combination to a given purpose.

The Indiana Scale was developed in connection with certain problems of research carried on thru the departments of psychology and sociology of Indiana University in the autumn of 1917. The problems were combined into a single research having a twofold aspect: first, that of selecting gifted children in the public schools, for special classes, extra promotion, or other assignment; and, second, that of determining the proportion of mental defectives among the school children of a certain county. The scale was later used in testing the pupils in three representative high schools of the state, besides several hundred high school children in other parts of the country. The utility and applicability of the scale have thus been firmly established.

The present test is an initial attempt to apply the Indiana Scale under approximately uniform conditions to a fairly homogeneous group,—the senior students in the six hundred commissioned high schools of the state. The test is administered under the direction of the division of inspection of the State Department of Public Instruction, in coöperation with the department of psychology of Indiana University. Its primary purpose is to discover pupils of superior mental endowments, thereby making it possible to give these students special help and encouragement to continue their education. Possible uses as a basis for vocational direction and placement of the youth of high school ages are yet to be determined. The experience of the Army Personnel Office in discovering and utilizing talent in the training camps during eighteen or twenty months of service by means of similar tests suggests fruitful potentialities in this direction.

Early in the present month, a letter announcing the proposed test and urging coöperation in its administration was sent to the high school principals. A small folder, explaining the value and significance of mental tests and suggesting possible uses of the present test accompanied the letter. Interest and enthusiasm on the part of the principals in the coming test were spontaneous and supreme. Many wrote urging that materials be sent without delay; others requested the privilege of giving the test, not only to seniors, but to the entire school.

Test materials have this week been sent directly to the schools. These include individual test papers for every member of the senior classes, an Examiner's Guide containing full and explicit instructions for giving and scoring the tests, and a report form for compiling individual scores and other data for every school. The principal and a teacher or teachers designated by him will have personal charge of the test in each of the schools. Not the least of the benefits that may accrue to the schools will be the initiation of hundreds of high school teachers in the use and scoring of mental tests.

All test papers and a summarized report of individual and class scores will be returned by each school to the State Department. From the returns a combined report showing the distribution of intelligence, the intelligence rating of the various schools in widely separated communities, will be compiled. An intelligence map of the state is among the possibilities.

The tests are ten in number, constituting a series testing a wide range of mental capacities from simple rote memory to practical information and use of analogies. Each test in turn involves some twenty mental operations, carefully graded, passing by easy stages from simple to more and more difficult thought processes. Probably not more than one pupil in every one hundred will possess the mental ability to make a perfect score. A time limit ranging from one-and-a-half to four minutes is placed on each division of the test. The entire series will require about forty minutes to administer.

The tests are so designed as to require a maximum of thinking and a minimum of writing or clerical effort, the answers consisting of a single word, a line beneath or a cross beside a printed word, or at most the rearranging of words in logical order in a sentence. Thus they satisfy the requirement of economy of time and effort both in taking the tests and scoring results.

As suggested above, the essential purpose of the test will be to uncover and mark native intelligence or mentality, which may or may not be greatly influenced by school training. A secondary object will be to discover what correlation, if any, exists between such native endowments and various factors in the pupil's environment. Provision is made for obtaining in every case data bearing on such factors as the pupil's social and economic status, as suggested by the father's occupation and yearly income; the pupil's scholarly proclivities,—his favorite subject in high school, his scholarship rating in the previous (or junior) year, his college aspiration, his vocational or professional outlook; and time spent and course pursued in the high school.

Such in brief outline is the plan and the scope of the projected test. Of what significance to the educator is such a testing of high school seniors likely to assume? What educational implications or results may it be expected to yield? The answer has already been suggested in part. Its primary object is to locate superior students to the end that such students may be urged and helped to go on to college. One such student given proper training may prove of priceless value to society. One of the tragic wastes of our society is the frequent neglect and loss of genius from sheer want of educational opportunity.

The intelligence rating of every pupil taking the test will become a constituent part of that pupil's high school record. His rating or intelligence score will thus accompany the pupil's certificate to college or employer. Of this important fact all are informed at the time of taking the test. In this way, college faculties will be furnished in advance with a clue to the native ability of their student material. They can determine without delay whether or not a given student is doing work in college in keeping with his native capacity.

Again, the proposed testing is likely to give to the schools some insight into the relative abilities of their pupil material. It may afford some clue as to the degree in which a given school is securing results in relation to the abilities of its students.

Other and subsequent uses are suggested by the possibilities in giving vocational guidance or direction, assistance in dividing classes into sections according to ability, and developing types of courses of instruction suited to varying degrees of mentality.

Scientific Curriculum Construction

W. W. CHARTERS

The Factors in Curriculum Construction. The curriculum is a fusion of three ingredients: life objectives, human achievements, and child nature. Each of these possess certain characteristics which are essential to each and which influence the product.

Life objectives are those purposes which direct and control the lives of men. They constitute the aims of action for which men strive and have been commonly designated in pedagogical literature as the aims of education.

A determination of the aims of education is a necessary factor of curriculum construction because without them selection cannot be made from the great mass of human achievements which are available for instruction.

Human achievements represent the advance in control and ideals which man has made over instinctive control and unconscious purposes. These controls and ideals have in a very fundamental sense been achieved by man, bought with the price of thought and patience and effort. And by their transmission to ensuing generations, conservation and progress are alone possible; without this transmission the young would immediately sink back into lower than primitive conditions and the laborious efforts of our ancestors would disappear in a single generation.

These human achievements are multifarious. They consist of inventions in mechanical appliances, creeds in religion, customs of social life, principles of science, technique of art, habits, ideals, and prejudices—all the inheritance from older generations. Everything that is given to one generation by its forbears, or added by itself, except its instinctive controls and physically based cravings, have been achieved by man and are potential elements of a curriculum.

In the processes of time these achievements have been organized, in part. In part they await organization and in part defy it. The organized subjects are known as the sciences, literature, history, art, political science, economics, sociology, and so on. The unorganized achievements constitute all the remainder of experience, the margin out into which the boundaries of the organized area are being constantly pushed as new subjects take on form and system. And outside of the limits of possible organization lie a great mass of miscellaneous achievements, disconnected, accidental, and local.

From this mass of achievements selections for the curriculum are made upon the basis of the aims of education, on the one hand, and the psychological characteristics—interests, needs, and abilities—of children, on the other. The child must live his immediate life and at the end of his youth enter upon the participating and contributing adventures of adult society. These abilities, interests, and needs determine the order in which he is made acquainted with human achievements. They, also, determine in part the selection of the achievements; for we cannot assume that the achievements which are most useful for adults are, also, most necessary for children. Adult living does not value highly for its purposes such achievements as infant games or fairy stories altho it is clearly evident that for children they perform a notable service.

The foregoing statements are common property. The relation of the aim of education to the selection of subject-matter has been recognized in the writings of the great educators since the time of Plato, and their relation to the nature of children has been recognized with growing clarity since the time of Rousseau. They have all been discussed for generations and are today the object of widespread discussion.

The Causes of an Inadequate Curriculum. But we are not satisfied that the curriculums of the schools fit the needs of modern life, and our discussions do not seem to produce adequate improvement.

That this is the case is due to three factors which are worthy of careful consideration. The first is the assumption made universally until in recent years and by many at the present time that the best method of equipping for life is to acquaint the young with the organized fields of knowledge in such order as to reveal the systematic arrangement of each. The second is the failure to analyze the aims of education—continue the analysis until objectives sufficiently detailed have been determined. The third is the failure of educational psychology to assist the trial and error method of testing, by providing a body of facts according to which the material of the curriculum may be arranged in proper pedagogical sequence.

The Organized Fields of Knowledge. There is much to warrant the assumption that the organized position of human achievement such as the sciences, literature, and history constitute the material most useful for the fulfillment of the aims of education. It is the product of master minds and of painstaking followers who with admirable singleness of purpose have devoted their lives to the discovery and systematization of their fields. The influence of their substantial findings upon human life is often spectacular and seldom negligible. Then, too, the material seems easy to learn because of its orderliness and easy to impart because of the system. Further than this, the assumption has gained and held credence that when principles are mastered the learner himself can make their applications to his purposes and problems of living. These beliefs give plausibility to the assumption that the best that man has accomplished is the most nearly adequate equipment for the rising generations.

The Best That Man Has Accomplished. But the validity of the assumption rests largely upon the interpretation of the meaning of the "best that man has accomplished". For it may mean either the most highly organized, the most original, the apical achievements, those which by their sheer sublimity make man as the master mind of the world, or it may mean the most useful where the amount of utility is determined by the number of people who can profitably use it and the value it possesses for them. It cannot be assumed that the best examples of mental brilliancy are the best instruments for daily living. As an example of the brilliance of the human mind, the discovery of the law of gravitation immeasurably outshines the discovery of cooking; but on the basis of daily living, the instruction in cooking is vastly more important than the teaching of the law of gravitation. If, therefore, by the term, the best that man has accomplished, is meant the most useful for daily living, the assumption that the organized fields of knowledge are the most nearly adequate equipment for the immature does not hold.

That acquaintance with these organized masses of achievements is not necessarily the best material for instruction is due to the method of their growth. It is a matter of common knowledge that the older sciences and probably all the newer ones as well had their origin in the context of daily life. Many were begun by the common people. The women of the tribe searched for herbs to cure tribal ailments and thereby introduced the study of botany. And in due course of time, when the tribe could afford the luxury of supporting a doctor, the medical profession greatly widened the search for herbs and collected information about and samples of new and potent plants discovered in the far parts of the earth. As time went on it was only natural that the inquisitive mind of man should seek to classify all the plants of the world, whether useful for healing or not. Later when the microscope and the theory of evolution were discovered new generations as they studied plants became interested in the relation of one plant to another, in the structure of plant cells, in the relation of plant life to physics and chemistry, in microörganisms, in adaptation to environment, and the other multifarious problems of modern botany. And as they discovered new facts, the botanist sought for basic principles and organized his knowledge in as systematic and logical an order as possible. But the study of plants in their relation to the art of healing has long since been outgrown and is now relegated to a minor division of the field which is studied by druggists and doctors.

The content of highly organized fields of knowledge is essentially not determined by daily needs and practical considerations. The specialist in the pure sciences has only secondary concern for the practical utility of his discoveries. He leaves to the less well organized applied sciences the selection from his products of those which may have practical utility.

But while he is not influenced by his neighbors in practical life, he is notoriously sensitive to advances made by his neighbors in other highly expert fields. It is a matter of common knowledge that when biology substantiated the theory of evolution and worked out a technique, it profoundly influenced ethics, religion, and sociology.

The results of this are twofold. In the first place, the content of a field of knowledge is partly accidental. It is obvious that discovered knowledge must affect the discovery of new knowledge, but there is no great guiding power which gives research constancy of direction; no scientist can foretell what the content of any field of knowledge will be in the next generation. It is accidental because of the personality of investigators and the discoveries in neighboring fields. Darwin was a man of a certain patient and persistent type who took hold of a theory floating in the intellectual atmosphere of his time and proved with adequate rigidity that it was correct. If, however, he had been of another type, a speculator and a dreamer, he would have been content to talk about the theory, and today the content of many fields of knowledge might well have been quite different. The discovery of radium was not a necessity. Curie might have been run over by a cab twenty years earlier, and if so the content of physics and chemistry would have been substantially changed from what they now are. Perhaps at some time and under some circumstances, these discoveries would have been made but there is no certainty of such an occurrence. Every science is filled with undeveloped leads which, had they been developed by some investigator, would have made profound modifications in its structure.

In similar manner the development of a field of knowledge depends upon the discoveries in other fields. The discoveries of science have affected the content of theology and ethics, those in chemistry have influenced biology, and those in neurology have affected psychology. For the alert worker in one field narrowly watches the methods in another field, and when he discovers others which seem to be fruitful he is almost as likely as not to drop the problems or the methods he is working with and take up the new ones which seem to him to be more interesting and significant.

So for these two reasons the content of any field of knowledge is not, as the popular mind supposes, a great immutable structure based upon and inherent in the metaphysical nature of matter. Rather it is constantly changing and to a very considerable degree is dependent upon the interests and previous discoveries of quite mutable men.

We cannot foretell the social problems of the next generation with any greater accuracy than we can prophesy about the content of science at that time. For instance, if wiser counsel had prevailed in the conference of the War Lords in July, 1914, and it had been thought better to wait ten years or twenty before the campaign for a place in the sun should be launched, we should have had problems of daily living in America today notably different from those which now confront us. Whatever our ideas about predestination and purposes which shape our ends, it is agreed to by all except the extreme fatalist that the problems of daily living change from day to day and from generation to generation according to no discovered laws which are capable of controlling their emergency.

It is evident, therefore, that the content of the fields of organized knowledge will not parallel the problems and needs of daily life. The fundamental discoveries of science were not obtained in a search for solutions of the fundamental problems of living. They were obtained by men who were seeking to develop narrow fields of knowledge whose content is to a considerable degree influenced by chance. Indeed, if science had developed with the avowed purpose of solving problems of daily living, only the most nimble gymnastics supplementing the most sensitive attention to the changes in daily thinking and action would guarantee that the subject-matter could be accepted *in toto* as an adequate equipment for living.

The Function of the Applied Sciences. Outside the school, this lack of connection between the fields of knowledge and practical life has been recognized by both the scientist and the practical man, and as a result the new, less highly organized and less sure-footed applied sciences have been developed. The purposes of these agencies is the study of both the fields of science and the field of practical life in order to make applicable to the latter, not all the facts of science, but such of them as will be of use in the solution of practical problems.

This plays ducks and drakes with the logical organization of the pure sciences. For with an audacious nonchalance the practical science takes the facts and principles as it needs them. Its problem is to satisfy some human need and in doing so it may select facts from a dozen fields of knowledge and organize them, not on the basis of the principle of each field but according to their utility for meeting practical needs.

The methods of selection in the field of applied science are significant. The applied scientist may do either one of two things and usually does both. He may take up the facts and principles of science one by one and ask the question, Is this of any practical use? If it is he develops the method of making it usable. If it is not he discards it. Or he may study the problems of practical life, and, finding some of greater importance than others, he may ask the question, Is there anything in science which will help in the solution of these problems? And in similar manner he selects from the sciences those items which he can use and ignores the others.

This procedure is significant because of the ruthlessness with which it treats the sciences and the sensitiveness it shows for practical needs. Daily living is paramount and the facts of science are merely collections of tools which have varying degrees of usefulness. This is particularly significant in curriculum construction because it is an example of a second method of constructing a curriculum. The first we have been discussing from the outset—the determination of the items in a curriculum by the assumption that the aims of education can be best met by the impartation of essential content of each of the highly organized fields of human achievement. The second, that of studying the daily lives of men to find the most important problems and the selection from any source available of such items as will solve these problems is the method of applied sciences.

The Case of Elementary Science. The case for the organized fields of achievement is still weaker when applied to the teaching of immature students. For to meet this immaturity it has been assumed that the outline or skeleton of an organized body is easier to learn than is the more fleshly clothed structure. This accounts in part for the fact that books for beginners are thin while books for the initiated are fat. But a moment's consideration will show that this procedure is wrong. In such a case volumes and chapters are condensed into single sentences and paragraphs, the material is stripped of the content by which alone it can be made clear. One by this means obtains a faithful reproduction in miniature of the whole field, but the immature and inexpert mind is unable to grasp it and therefore to use it. The psychology of the child teaches this most convincingly that children achieve the ability to organize only to a very slight degree. They are not specialists either with respect to scientific interest or to the patience necessary to systematize logically a mass of unrelated facts particularly if it is of little interest to them. They are like most people who are not specialists, the creature of their more immediate needs and pressing problems.

Consequently, the curriculum which is presented to children as a reduced photographic reproduction of a great field of knowledge neither solves the problems of their present or future daily lives nor does it obtain their comprehension. To a very considerable extent it is a meaningless recitation of facts lightened here and there by occasional spurts of interest in isolated items. This accounts for the commonly made observation that the sciences from which so much was expected when they were introduced into the schools may easily become as formal as any subject in the curriculum. The students of these fields of knowledge are often "like birds which fly abroad to forage for grain and bring it home in their beaks, without tasting it themselves, to give it to their young".

The Failure to Analyze the Aims of Education. The second factor which operates to make curriculums inadequate for daily living is the failure to analyze life objectives in sufficient detail. The meaning of this can be made clear by illustrating the method of analyses of life objectives and determining what detail is sufficient.

The aims of education are statements of the best objectives for which men strive, and these have been discussed for centuries. Some thirty-five statements are found in a history of education and they divide themselves into eight classes: morality, religion, knowledge of classics or environment, social leadership and efficiency, discipline, development of the powers of the individual, complete living, and practical success.

Among investigators, Plato was the first to discuss the aim of education and determine the curriculum. His aim is to develop knowledge of the good. His curriculum which he presents in some detail he attempts to justify in terms of his aim. And he asserts its content to be music—Dorian or Phrygian; mathematics—arithmetic, geometry, and astronomy; literature—tragedy (always containing only images of the "good") but no comedy; rhythm; harmony and observation. But he makes no detailed attempt to determine the sequences of his items according to the nature of children.

Twenty-two centuries later Spencer defined the aim of education as complete living. He analyzed this into five types of activity: self-preservation, earning a living, parenthood, citizenship, and occupation for leisure, in decreasing order of importance. From these he deduced a curriculum consisting of physiology, reading, writing and arithmetic, physics, chemistry, biology, sociology, ethics, and psychology. But, like Plato, he was not concerned with the sequence of the items of these subjects.

Rousseau in the centuries between Plato and Spencer defined the aim of education as follows: "The aim of education is to develop naturally the innate instincts and interests of an individual in such a way as to lead to an expansion of these natural powers in a nature which is given, not made." His curriculum deduced from this aim consisted of subject-matter derived from nature (not man), the science of duty, language, Robinson Crusoe, manual labor, and so on. In addition, he described, as Spencer and Plato do not, his conception of the psychological nature of the individual and by it arranged the sequence of the items in his curriculum.

These three samples of curriculum construction display the failure to analyze. Each mentions certain subjects which are to be taught. But what physiology and chemistry should be taught for complete living? What subject-matter derived from nature is best to develop the natural powers? What Dorian music is needed to develop ideas of the good? The answer is not given. Possibly it is assumed that these fields of knowledge should be presented in organized form altho it is evident from the foregoing discussion that such an assumption is invalid. More probably the great educators and all writers on the curriculum have not been concerned with details and have left to teachers the selection of the parts of the subjects to teach.

And herein lies the difficulty. These aims of education are stated in very general terms so vague in content that they provide no standard for selection of subject-matter. What is needed to supplement them is a method by which the aims may be brought into contact with detailed units of subject-matter.

The same difficulty appears in teachers' meetings wherein the claim is constantly made that the curriculum should fit the needs of children. But what the needs of children are have not been defined and no method for determining them has been perfected. And as a consequence the most enthusiastic advocate of adaptation to needs is more likely than not to preach reform and practice conservation.

This great gap between the aim and subject-matter, which cannot be bridged without analysis, produces some rather interesting results. It has been found that the great educators who have different aims frequently select the same subject-matter by which to realize it. Nor is this always due to logical results logically arrived at, but rather to the fact that the gap is so broad that logic cannot leap it and the writer falls back on tradition and teaches what is in the schools. Sometimes it is due to the personal opinion of the writer, and this opinion is frequently formed upon the basis of his own personal experiences as in the case of Rousseau, who bridged the gap by expanding the informal, out-of-school, curriculum thru which he as an orphaned waif was conducted.

Bridging the Gap between Aims and Subject-Matter. However, it is possible to bridge this gap by a much more scientific method and arrive in the zone of activity within which objections and subject-matter mingle and face. This method is the analysis of life objectives.

An illustration will make this clear. Spencer has defined the aim of education as complete living and has said that certain subjects as physics and chemistry will constitute the curriculum. But we are at once faced with the question, What is complete living? Fortunately for us, the author analyzes it into self-preservation, earning a livelihood, parenthood, citizenship, and occupation for leisure. But he leaves the matter there and in leaving it thus, he helps but little. If one of these—earning a livelihood, for instance—is taken, the question must be repeated. What must you know to earn a livelihood? Obviously, an answer to this cannot be given in that form. For it depends upon what form of livelihood is selected. Analysis is again needed to determine the objectives of livelihood. This will reveal among other things a list of possible occupations, as for instance carpentry. Again the question must be asked, What does a carpenter need to know? This involves a further analysis of the "jobs" a carpenter has to perform, the skills he needs, the ideals that should dominate his work. Suppose the jobs are listed and that one of them is building a frame dwelling. Again analysis is needed to determine what are the subordinate jobs in this larger job. These consist of framing, shingling, and so forth. Selecting shingling as a job, again the question is raised as to what processes are necessary in shingling. These consist of the selection of the shingles, their treatment, method of laying and nailing. Again if we select nailing as a process, it may be necessary to analyze nailing into its processes as the most convenient nail receptacle, the finding and placing of nails, and hammering.

It may seem a long and tedious stretch to travel from complete living to nailing shingles. Complete living is a fine-sounding phrase and shingle nailing is very prosaic. But the steps are logical and the distance must be traveled by the curriculum maker. For the fact cannot be successfully controverted that while indefinite and general aims of education have had great influence upon curriculum, use has been negligible except where the enunciator of an aim or his adherents have taken the trouble to work out the details of the curriculum thru some analysis of the aim.

This analysis is tedious, and educators who have been in the habit of settling all problems of education including the curriculum by argument rather than by investigation do not hasten to undertake drudgery. In this they are, of course, quite different from the scientist who spends hours and days upon the details of some small item of investigation and who often has to discard weeks of work because some slight error has crept in. But as time goes on and the scientific attitude pervades educational investigations more widely, this drudgery will be cheerfully undertaken and then but not till then can we hope to substitute established fact for personal opinion.

The Limit of Analysis. Two factors determine the extent to which this analysis needs to be carried on. The first is the nature of subject-matter, the second is the ability of the learner.

The subject-matter of education, which is constituted by the achievements of man, is a collection of small units which may adhere in larger groups and these in still larger groups. For instance, to take the illustration used just above, carpentry is a collection of projects such as floor laying, framing, shingling, etc., and these projects are groups of subordinate processes as for instance where shingling consists of units such as driving nails and laying shingles.

Working Units of Achievement. The significant fact is that the unit of achievement in this case is not carpentry and not shingling but driving nails or laying shingles. By this I mean that man in his attempt to achieve the conquest of his environment worked in very small units. He covered one short step at a time rather than the whole distance with seven-league boots. His total progress was made by the achievement of one tiny objective after another. This is true of carpentry, which is not a unit but is a collection of many units. This is equally true of the great organized fields of knowledge. Science has been developed bit by bit. It is obviously true of history which consists of a series of acts. Just as clearly it is true of the great life objectives. Comenius's "eternal happiness with God" is a collection of acts dominated, to be sure, by a single purpose but nevertheless achieved by minute actions carried thru from moment to moment.

The fact that all achievements have been made in small units is of supreme importance because it determines the form in which man uses his achievements when made, the form in which we find them recorded and, therefore, the form in which he transmits them thru instruction. This is the level on which instruction can most economically be given. The analysis of life objectives must, therefore, be carried on until it reaches the zone of man's working objectives. And the curriculum when constructed will consist of a mass of these working objectives which for purposes of easy handling may be collected into groups called subjects, upon the basis of similarity of material or principles. Perhaps the chief difference between the curriculum of one who has not attended school and one who has, lies in the fact that the former has a mass of unorganized units while the latter is able to see principles running thru certain groups of the units. But whether the curriculum is organized or not its elements are these working units. Nor can I refrain from saying that if the principles are not used as integrating instruments in classifying units otherwise existing as isolated facts in the experience of the student, they are quite useless except for decorative purposes.

This idea of working units of achievement has not received the attention it merits in curriculum making. It is sometimes recognized and used by the teachers after the curriculum is made because the teacher has to use it if the children are to learn anything, particularly in the lower grades. But even there and much more constantly in the upper grades the textbook makers and the teachers give the material to children in units which are too long, which are longer than those which man uses and teaches outside school. The illustration of neatness comes to mind. Teachers say to children "Be neat" or "That is not neat"; but the child may not know how to achieve neatness. Certainly man reaches it by smaller steps. Outside school in the home it means such jobs as picking up articles on the floor, arranging books in regular piles, and hanging coats on appropriate hangers. Therefore, the teacher's "neatness curriculum" must come after an analysis of neatness and the listing of the objectives which when reached will produce neatness—such as no scraps on the floor or an even left-hand margin.

And in similar manner teachers, superintendents, and professors of education talk about social efficiency, complete living, morality, and the other current aims of education, but the failure to analyze these and re-analyze them until the working objectives have been reached has resulted in two worlds, one world of talk about curriculums and another world far removed from this, the teacher's daily curriculum, still controlled by tradition and habit and but little influenced by any aim that resides in the other world. The gap between the two worlds can be bridged and by a thorogoing analysis of the aims of education.

Working Objectives Lie in Zones. The working unit of achievement constitutes the theoretical limits of analysis. In theory, analysis proceeds until the working objectives are reached. In practice, however, it is found that these working objectives lie in zones. And the degree of analysis after the upper boundary of a zone is reached is dependent upon the ability and previous experience of the learner.

For instance, the federal government has for the last two or three years advocated the canning of tomatoes by the cold pack method. It is evident that for some women no further information is necessary. Stimulated to can tomatoes by a patriotic appeal they proceed to do so because they had the experience and knew how to do it. But some women who accepted this objective as worth-while did not know how to do it. And for these analysis was necessary. The steps in performing this consisted of collecting the canning utensils, taking care that everything was clean, testing the jars, lids, and rings, grading the tomatoes, scalding them, packing in jars, flavoring to suit taste, sealing lightly, cooking for twenty-two minutes, and sealing tightly. This evidently might be in sufficient detail for some experienced women with less knowledge than the group first mentioned. But as a matter of fact it was found that the demonstrators in their canning campaigns had to analyze each of these directions into still smaller steps in order to reach the working units of the practical housewife. For instance, instead of saying merely, Collect the canning utensils, taking care that everything is clean, some demonstrators found it necessary to give these steps: Secure a well-screened, light, airy room, free from dust and protected from drafts, containing a good stove, a supply of clean fresh water, a table, a dishpan, a kettle with a lid, teakettle, paring knife, sack of salt, teaspoon, tablespoon, supply of glass jars, etc., and wash the hands thoroly, clean finger nails, and don clean apron and cap. Moreover, it is evident that with still less experienced cooks, with little children for example, some of these steps would need to be re-analyzed as, for instance, how to wash the hands thoroly or don an apron. It is evident also that this canning project would be too large a unit for very young children who would not have a mastery of the items obtained by the final analysis.

It is, therefore, clear that the limit of analysis is the zone of working objectives within which lie the units of achievement with which man works, that above this zone the analysis of aims of education must not stop, but that within it the degree of analysis depends upon the experience and ability of those who are receiving instruction. The failure to conduct the analysis of aims of education from their lofty and nebulous heights thru intervening levels to the zone of man's working units of achievement has contributed in no small degree to the static condition of the curriculum presented to the children by classroom teachers.

Collecting Achievements. Once, however, this has been done, once the specific objectives of daily living have been deduced from the major objectives of life, the next step in curriculum construction follows. This is the collection of the best method man has discovered and used for the reaching of these objectives. When the specific problems of daily living are determined it is then possible to select from men's achievements those practical solutions which have been found to be most satisfactory. And again it should be repeated that these are not necessarily found to be identical with the highly organized fields of knowledge. They are found in parts of these fields, to be sure, but they are also found in the less highly organized fields, in the portions of the field capable of ultimate organization, and in those portions which defy organization. They are appropriated wherever they are found without regard to any standard of origin and entirely upon the basis of their usefulness.

Educational Psychology. The third factor which has affected the progress of curriculum construction is the failure of educational psychology to render adequate assistance in classifying or delimiting the interests and abilities of children in such detail as to provide directions for sequence in instruction grade by grade. Whether this task is incapable of performance we do not know at present, but that it has not been done is clearly evident.

The problem in curriculum construction which educational psychology might be able to solve is an important one. We have seen that the analysis of the aims of education and the collection of the best methods of fulfilling them gives us a mass of material but it does not provide any basis for the determination of the time of teaching this material. If educational psychology could furnish information sufficiently definite for the curriculum constructor to determine objectively that one item or another should be taught in one grade or another, the assistance would be vital.

Stages and Development. Some attempts have been made at a classification of the years of childhood according to stages, but these are not based on scientific ground, there is no consensus among the writers themselves, the stages are usually two or more years in length, they are recognized by the writers as at best only approximations, they do not conform to grade units, and are not accepted by teachers as being practical. Some attempts, also, have been made to obviate the difficulty of analysis of the short complex life of the child by throwing it on the screen of history in magnified form thru the recapitulation theory, wherein the claim is made that long stages of evolutionary development are represented by short stages of child life. This conception has been carried farther in the culture epochs theory which seeks not only to determine the stages but also to solve the problem of curriculum making on the basis of the claim that in each stage of child development determined by the recapitulation theory, the culture of the corresponding historical stage should be the subject-matter of instruction. But both of these theories seem at present to be untenable.

However valuable educational psychology has been for methods of instruction, its contribution to curriculum making, particularly to curriculums suitable for teaching children in groups, has been almost negligible.

Education and Life. That there is a necessity for a more thoro testing and tabulating of the interests and abilities of children is evident from the current beliefs about the relation of needs of children to the curriculum. There are, in particular, those who hold that the curriculum should be determined by adult objectives to the extent that children should be taught the solutions to problems which they will meet in adult life. There are others who hold that children have needs and interests of their own and that the curriculum should present material for the solution of their immediate problems. One group holds that education is a preparation for life, the other holds that it *is* life.

The conflict would be partially resolved if it could be assumed that in the years of youth the individual would encounter all the types of problem of adult life. But no study of this has been made and partial examination seems to substantiate the claim that such would not be the case. Consequently, to construct a curriculum that would involve both of these ideas it is necessary to determine those objectives, interests, and needs which are highly important for children but are low in importance for adults. That there are many such is clear. Fairy stories, children's games, Mother Goose rhymes, and the choice of an occupation are a few items which among adults rank low in importance but in school curricula seem to be of great importance.

The discovery of these objectives of children which would supplement the important items of adult daily life is a necessary part of the study of the nature of children.

And not only do children's interests need to be determined. Their ability affects profoundly the sequence units in the curriculum. For it is evident that the units cannot be economically presented before the requisite maturity and experience for their assimilation has been secured. If educational psychology could give practical assistance in these respects the labor of curriculum construction would be greatly lightened.

The Trial and Error Method. In the absence of assistance from this source the division of the curriculum into grade units has to be accomplished by the trial and error method. The framer of curricula must in the light of his own experience and that of the classroom teacher make what in the combined judgment of both seems to be the best arrangement and he must then have it taught to children to see what modification, addition, or elimination must be made.

This, in itself, is a complicated and laborious process for which an adequate technique has not yet been developed. It involves both the training of observers and the construction of standards. It requires extended verification by large numbers of teachers and classes and patient willingness to take almost unlimited pains. And all of this is foreign to the training and habits of school people who are accustomed to settle such matters in an offhand way upon the basis of unscientifically determined personal opinion. But, again, it is no less than any worker in the sciences accepts as a matter of course. The scientist cannot be parsimonious of either time or case. And curriculum construction cannot be scientific until the same amount of patience, intelligence, and drudgery is expended upon it.

As a supplement to the consideration of the factors which have affected the failure to reconstruct the curriculum with greater dispatch I should like to present certain directions for curriculum construction which are for the most part implied in the foregoing discussion, and to describe some of the scientific investigations that have been made in the field. But before doing so it is necessary to mention two factors which operate in the construction of all school curricula. One of these is the element of time. The other is the element of curiosity and intellectual interest.

Intellectual Interest as a Factor in Curriculum Making. The claim is made for many school subjects, particularly in the high school, that their justification as a subject of study is intellectual interest. It is pointed out that the men who work in them are not actuated by any other life objective than that of satisfying intellectual curiosity and that the fostering of this capacity of the human mind should be one of the duties of the schools.

While this would seem at first glance to introduce a new factor into curriculum construction, a more extended consideration will reveal the fact that in the list of major life objectives the satisfaction of curiosity would or might be listed and that it would be treated in the same manner as the others. If it were found to be one of the most important it would have to be given a prominent place in the curriculum, but if it came low in the list it would receive less attention, or if it were found that it was not peculiar to one group of subjects but was an objective which was connected with every subject it would receive a different sort of treatment.

The Time Factor in Curriculum Construction. The element of time is extremely important in the determination of the curriculum. For after all of life's objectives are analyzed and the subject-matter which has been developed by man to reach them were collected we should have a mass so great that acquisition would be physically impossible for any individual no matter how many centuries he lived. He could not even keep pace with new knowledge.

Opposed to these centuries is eight or twelve years of school life during which some of this material must be mastered. Evidently, therefore, there must be a right selection of curriculum items. High indeed is the honor of nomination to this academy of the immortals. Not lightly in an afternoon faculty meeting can the selection be made. Nor can we say that any members of this academy have vested rights in their position of honor. A new appraisal is necessary and each entrant must show his passport of distinguished service to humanity.

This paucity of years necessitates, therefore, an evaluation of the objectives of daily living upon the basis of importance and their arrangement in serial order from the most valuable to the least important. This list should, in turn, be modified by a similar evaluation of a supplementary list of the objectives in the daily living of children. And when these are formed the procedure to follow should be the determination of the number of these that can be taught in eight or twelve years with due regard to the interest and ability of the children.

In the construction of a school curriculum there will be eliminated those objectives which can be administered by agencies other than the school.

Directions for Curriculum Construction. These factors and their implications give seven rules for the construction of a curriculum.

1. First, study the life of man in the social setting and determine the ultimate objectives toward which he is striving.
2. Analyze these objectives and continue the analysis until working objectives are obtained.
3. Arrange these in the order of importance.
4. Raise to positions of high rank in this list those objectives which are high in value for children but low in value for adults.
5. Determine the number of the most important objectives which can be mastered in the time allotted to school after deducting those which can be learned outside of school.
6. Collect the best practice of the race in teaching these objectives.
7. Arrange them in their proper order of sequence according to the psychological nature of children.

This is a stupendous task for which few methods have been used and less have been perfected. But while the program is vast, it is no more so than that of any of the great fields of knowledge, and if the technique for performing the work can be worked out in a generation we shall be more fortunate than any of the sciences have been. The sole *desideratum* of final success is conscientious and intelligent effort directed upon problems which are of workable dimensions. For it is not necessary for any one individual to attack the whole problem. Science growing particle by particle has developed into an imposing structure, and the development of adequate methods of curriculum construction should be content to grow in the same inconspicuous manner.

Types of Curriculum Study. Fortunately for the progress of further investigation a variety of studies, crude and partial, have been made which are suggestive of the tendencies of investigators.

Spelling. The spelling curriculum has been studied more extensively than any other. The assumption has been made that spelling is of sufficient importance to be taught in school and the variety of studies has been determined by differences in the objectives which it is assumed to control. These studies are partial because an immediate objective is

Next Steps in Educational Measurements

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THAT phase of educational research which is known as educational measurement has been a very conspicuous factor in the progress of the decade which is just closing. When sufficient time has elapsed to give a proper perspective, the decade from 1910 to 1920 will doubtless stand out as marking the beginning of a distinct epoch in the development of our educational thinking.

The beginning of educational measurement in this country dates from Rice's pioneer studies. The first of these, a study of spelling, was reported at the Cincinnati meeting of the Department of Superintendence in February, 1897. His underlying principle that the primary result of teaching spelling was the engendering of ability to spell and that one could measure the results of teaching spelling by finding out how well the pupils could spell, not only failed to receive the approval of his audience but precipitated an extreme and violent attack upon the American inventor of educational tests. This criticism, not only in the discussion following the reading of the report but in the educational press as well, was directed not at the results of the investigation nor the method of the investigation but at the underlying principle. Such criticism is evidence that a quarter of a century ago American educators believed that the purpose in teaching school subjects, such as spelling, was not to teach the children to spell but to develop their minds, and they were violently opposed to the suggestion that the results of teaching could be measured.

The work of Rice, which included studies in arithmetic and language as well as in spelling, did not affect school practice directly, but, what is more important, it profoundly impressed other scientific students of education, notably Professor E. L. Thorndike. In 1908, C. W. Stone, a student under Thorndike, published his arithmetic test, and at the Boston meeting of the American Association for the Advancement of Science in December, 1909, Thorndike presented his scale for handwriting. These two events mark the real beginning of scientific measurement of educational products in this country. Beginning with the arithmetic tests devised by Courtis, who was inspired by the work of Stone and Thorndike, the number of tests has multiplied with marvelous rapidity. Today any determination of the total number of tests is almost certain to be out of date before it can be published. A year ago it was well above one hundred. Not only has the number of tests multiplied but a large number of copies of several tests are being used every year. For at least two series of tests the total number published has passed beyond the million mark and others will reach this mark at an early date.

The rapid growth of the science of education is also indicated by the establishment of bureaus or departments in colleges and universities for the purpose of carrying on educational research and for stimulating the application of the results of research in the public schools. For the most part the work of these bureaus has been confined to the field of educational measurements. In addition, a rapidly increasing number of school systems are making distinct provisions for the systematic use of educational tests by the establishment of a department having for its special function the supervision of the use of educational tests within the school system.

Before such an audience as this it is not necessary to recall in detail the activities of these bureaus or departments. In general, their activities fall into two groups, service and research, altho for the most part the research problems studied have been chosen with reference to making possible increased service. State bureaus established in colleges and universities have rendered service to the public schools of the state; *first*, by making educational tests easily accessible to the superintendents and teachers; *second*, by providing necessary accessories such as directions, class record sheets, and the like; *third*, by instructing teachers and superintendents in the giving of the tests, in tabulating the scores of the pupils, and in calculating the median or average scores; and *fourth*, by providing a clearing-house where the reports from the several cities were assembled and arranged in a form suitable for making comparisons not only among the cities but also between the cities and standard scores or scores from other states. Research has been carried on in the determination of the relation between the results of teaching and the course of study, in the determination of the efficacy of certain methods of teaching, and in some instances in the derivation of new tests. The activities of bureaus organized within a school system have been similar. They have rendered service by systematizing the use of educational tests within the city, by gathering together the results for the city as a whole, and by assisting in modifying instruction upon the basis of the results secured.

These outward manifestations are indicative of a fundamental change in our educational thinking which is now taking place. Within a brief quarter of a century, to a large extent within a decade, we have replaced the thesis that the result of the process of education is a general development of the mind which is not measurable by the thesis that the results of education include as fundamental elements specific habits and skills which may be measured with precision and also that many of the other outcomes are capable of objective measurement. The incorporation of this change, which is now generally accepted, in the educational thinking of superintendents and teachers will mark a more significant accomplishment than the multiplication of the educational tests and the establishment of organizations to stimulate their systematic use. It will mean that we are thinking of education as resulting in definite outcomes which we may definitely work for. Our purpose will be the engendering of these outcomes rather than the mere teaching of certain subject-matter. Our courses of study will be written in terms of definite objective aims instead of general qualitative statements. For example, the teacher of handwriting in the fifth grade will be told that she is expected to have her pupils able to write at the rate of sixty letters per minute and with a quality of sixty-five on the Ayres Scale, instead of being told that she is expected to have her pupils write rapidly and legibly. In silent reading the aims will be expressed in terms of words read per minute and definite degrees of comprehension. In the operation of arithmetic the rate and accuracy at which pupils are expected to be able to do certain types of examples will be specified.

As one reflects upon the accomplishments in the field of educational measurements during the past decade there comes the conviction that we are on the eve of significant developments and that state bureaus of educational research will have a prominent part in them. Much of the service which we have been rendering will no longer be needed. Soon it will not be necessary to instruct superintendents and teachers in the giving of educational tests and in the tabulation of results nor to urge their use. By means of the work which they are now doing they will have acquired this technique. Furthermore, they will have come to recognize the value of using these tests as instruments for making their efforts more effective. In the field of research, the problems studied have for the most part concerned the variability of pupils, classes, and cities. The conditions revealed have been corroborated so often that we may regard them as established facts, and altho comparisons of scores will continue to have a value, standards for widely used tests are now generally available for anyone who wishes to compare his scores with the standards. On the other hand, new problems are arising with which we must deal and it is to certain of these that I desire to direct your attention.

1. **The Evaluation of Existing Educational Tests.** The number of available tests has increased until we now have several for most of the subjects in the elementary school. Some of these tests have been constructed with care and upon the basis of sound procedure. Others have been carelessly constructed. In certain cases simplicity of form and convenience in use have been prime considerations; in the construction of others these factors appear to have been given no weight. Some tests are accompanied by a multitude of accessory directions, record blanks, and graph sheets. Other tests are not even supplied with directions for use. Some tests are designed to yield average or general measurements while others have been designed to yield specific or diagnostic measurements. Superintendents and teachers are already beginning to ask what is the best test in reading, in arithmetic, or in some other subject. "Is Test A better than Test B?" At the present time a rational choice of a test or of a group of tests in such a subject as silent reading or arithmetic is difficult if not impossible because there is not available the necessary information concerning the function, validity, reliability, precision, comparability, and similar features. Much information on these points for certain tests is scattered thru our educational

literature but nowhere is there to be found a complete account for any one test. There are a great many things about widely used tests which would be helpful to know but which yet remain to be determined. For example, the probable error or the coefficient of reliability is known only for a very limited number of tests and it is obviously necessary that we know the degree of reliability of our measurements before we can be certain in our use of them as the basis for planning instruction or in determining the relative merits of different methods of instruction. We need, therefore, a critical evaluation of our educational tests. In part this can be done by bringing together and organizing the facts which are now scattered thru our educational literature, but much original research will be required. In my judgment this is one of the most important research problems with which a bureau of educational research can deal within the next few years.

In order to make a rational recommendation of educational tests it is necessary that we have for a test the answers to the following questions:

1. What ability or group of abilities was the test designed to measure?
2. Was the test designed to yield general or diagnostic measures?
3. What are the significant characteristics or dimensions of the ability or group of abilities which the test was designed to measure?
4. What characteristics or dimensions does the test measure?
5. Does the test measure the ability or group of abilities it was designed to measure? Does it measure this completely? Is the pupil's performance on the test determined by this ability or group of abilities or is it determined to a variable extent by other factors such as his rate of writing, his language ability, his general intelligence, or the manner of the examiner?
6. Have the exercises been designed so that they cover or are representative of the field of ability which the test is designed to measure?
7. Will the acquaintance with this type of test influence the pupil's performance? If so, how much?
8. To what extent is it possible for pupils to make special preparation for the test and thereby make scores which are not valid indices of their abilities?
9. In comparing the scores of individual pupils, schools, or cities, how large must the differences be in order that these differences be significant? What is the variation in terms of probable error or average deviation of individual and of group measurements? What is the coefficient of reliability?
10. When it is desired to give a test a second time in order to determine the progress which pupils have made what allowance must be made in comparing the two sets of scores?
11. How much time is required from pupils and from the teacher for the giving of the test and tabulating the results?

The answers to some of these questions should have greater weight than others in determining our recommendation. For example, if a test is to be used by teachers it must not require an unreasonable amount of their time. Also the test must be accompanied by the necessary accessories.

When tests are subjected to a critical evaluation such as has been suggested we will undoubtedly find that many, possibly all, of our educational tests are relatively crude and that there is a distinct need for more refined measuring instruments. For example, up to the present time relatively little attention has been given to the analyses of the subject-matter fields in which tests have been constructed. We do not have an analysis of the subject-matter field of silent reading altho we have many silent reading tests. The need for such analyses is more obvious in such a subject as spelling and as a result we have had numerous determinations of the words which pupils should be asked to learn to spell and consequently which should be used in constructing a spelling test. Most of the analyses which have been made are best known in connection with the determination of the minimal essentials or scientific curriculum making but they are also fundamental in constructing educational tests. In the process of refining our present tests or in constructing new ones it will be necessary to invade this field.

The mental processes involved in the different school subjects must also be analyzed so that we can know just what the essential characteristics or dimensions are of the abilities which we are attempting to measure. In the operations of arithmetic we have found that we have to measure not one ability but many abilities which are to a certain degree independent of each other, and that the essential characteristics of these abilities are the level of difficulty, the rate of functioning, and the accuracy of the functioning. This condition places certain definite requirements upon tests in this field. In other subjects, similar analyses have not been carried as far. In silent reading the indications are that there are a number of different kinds of reading ability but the analysis is incomplete. We have at least six different silent reading tests which have been widely used and it appears that no two of these measure the same silent reading ability. This condition indicates the need for a scientific determination of the relative importance of these silent reading abilities and whether these are all of the important silent reading abilities. Until such determinations have been made, selection of a silent reading test will be largely a matter of personal opinion.

These are two lines of allied research which must be entered before we can have properly refined instruments for measuring the results of teaching.

We should realize that educational measurement is not an isolated topic in the field of education but that it has many vital connections. One cannot go far into this topic without forming many contacts with other topics, and students in other fields of education are constantly making contacts with educational measurements. In making this point I am not advocating an imperialistic program of expansion for the field of educational measurements, but I am simply indicating the dependence of this department upon other lines of research. Workers in the field of educational measurements must acquaint themselves with the results in these allied fields and probably even enter them in order to secure fundamental information.

2. More Refined and Complete Interpretation of the Results. We must also refine and enlarge our interpretation of the results of educational measurements. The meaning of scores is limited and depends upon factors other than the differences between them and the standards. Not infrequently misleading conclusions have been reached because certain potent factors were neglected or because the scope and function of the test were neglected. For the most part up to the present time our interpretation has been confined to the comparisons of city scores or school scores. There is a distinct need for extending our interpretation to include the scores of individual pupils.

Any test measures the results of instruction only over a very limited field and we must constantly bear in mind these limits in interpreting the results. We are accustomed to speak of a test in the field of arithmetic as an *arithmetic test* and thereby imply that it measures all of the results of teaching arithmetic. Unless it consists of a very elaborate series of tests it is impossible for a single test to cover this entire field: The most widely used arithmetic test is the Courtis Standard Research Test, Series B. It covers only the field of the operations with integers and it covers this only in a limited way. It is, therefore, misleading to think of this test as measuring the results of instruction in arithmetic. It measures only certain results of instruction. There are several types of examples in the operations with integers besides the four operations with fractions, both common and decimal, and the whole field of problem solving concerning which this test gives us no information. Therefore, in interpreting the scores of this test it is necessary to bear in mind the limits within which it measures the results of instruction. To conclude, because a school makes scores up to or above standard on this test, that the results of instruction in arithmetic are satisfactory is to reach a conclusion not based upon fact and which in some cases will be erroneous. Of course one may take the position that even if this test does not cover the entire field of arithmetic, the scores are representative of the entire field. This assumption may be justified when the test is given for the first time but where it is used regularly the outcomes measured by it are likely to receive special emphasis in teaching and this has been found to be the case in some cities.

A test in the field of reading is generally spoken of as a reading test, which implies that it measures all of the results of instruction in reading. Reading appears to be an exceedingly complex field and any one test probably covers only a small portion of that field. It is, therefore, misleading to consider the scores of any one test as representing all of the outcomes of the teaching of reading. We need to analyze our reading tests so that we may know the limits of the field of ability which each measures. Until we do this a large element of uncertainty and possibly error will be involved in our use of reading tests. What is true of arithmetic and reading is also true of the other subjects for which tests are available.

There is a need for another type of refinement in our interpretation of class and city scores. There is a distinct tendency to rate a school system or a class which has median scores higher than other similar groups as being more efficient. We have not taken into consideration in this interpretation the fact that both school and city scores depend upon a number of factors other than the quality of the instruction which the pupils have received. Obviously the results of instruction depend upon (1) the time allotted to the subject by the course of study, (2) the length of the school term, (3) the regularity of attendance, and (4) the promotion rate. Neglecting the promotion rate when comparing two cities is to place a premium upon a low rate of promotion. For it is obvious that the scores of any grade can be increased by holding in their grade pupils who make relatively high scores and who, therefore, should be promoted to the next grade, and also by holding in the grade below pupils who make low scores and who because of their standing in other subjects or because of their age should be promoted. The scores of a class or city also depend upon the elimination of pupils and provisions for segregation of backward pupils. Some of these factors are doubtless more influential than others, but before we can make a reliable interpretation of a class or city, it is necessary that we take all of them into account. The development of the technique for doing this constitutes one of the research problems with which bureaus of educational research must deal in the future.

The interpretation of scores must be extended to individual pupils or at least to groups of pupils within the class. Mass interpretation is crude. It tends to eliminate the characteristic differences of pupils and to reduce all to a common level. That pupils differ widely in their achievements is demonstrated every time a test is given to a representative group. They also differ in their needs and in respect to the kind of instruction to which they will respond. A certain type of instruction will be helpful to one pupil or to a group of pupils while to others it will be of little or no assistance.

In extending interpretation to individual or group scores it is necessary to keep in mind that pupils having the same scores do not necessarily have the same instructional needs. For example, two pupils may make low scores for entirely different reasons. It will, therefore, be necessary frequently to supplement the scores by additional information. Sometimes this can be secured by analyzing the pupil's performances which are recorded on the test paper. Occasionally, it will be necessary to subject the pupil to an individual examination in order to study more fully his mental processes. It thus becomes necessary that we know the significant characteristics of various kinds of performances and the meaning of each. We must be able to translate the errors of pupils and also their creditable performances into their needs for future instruction. The educator needs to do what the physician has done. When a physician is called upon to prescribe treatment he examines his patient to determine his medicinal needs. He does this by noting certain characteristics such as pulse rate, temperature, appearance of the eyes and tongue, etc. A physician who knows the meaning of the facts he finds easily translates them into the needs of his patient.

For the most part this is a virgin field, altho it gives great promise of profitable returns for the time and effort which may be invested in it. We need to collect and study the errors which pupils make. All errors are not alike. If one hundred misspellings of a word are examined it will be found that a few ways of misspelling the word have been repeated many times while others occur only once. A misspelling which recurs twenty times has a meaning different from one which occurs only once. What is true of errors in spelling is true of errors in other subjects. We need to study the performances of pupils so that we may know what they mean.

3. **Modifying Instruction on the Basis of Educational Measurements.** Many of those who have contributed to the development of educational measurements have stopped their work with the measurement of the results of teaching. Some have actually advocated that it was not wise to go farther and that the improvement of instruction should be left to workers in the field of methods. However commendable this may be from the standpoint of professional courtesy, it has not proven satisfactory in practice. There has been much waste in the use of educational tests because emphasis has not been placed upon the use of the results in the improvement of instruction. Frequently the work has stopped with the tabulation of the scores of the tests, and both teachers and superintendents have expressed dissatisfaction with the tests because they were not able to detect any improvement in their pupils. Not long ago I inquired of a superintendent in a city of about 50,000 population concerning his use of educational tests. He remarked that they had used the tests, in fact they made it a point to keep up-to-date and to give new tests in at least one or two schools. He added what was to me a very significant statement. He said "We gave the Courtis Standard Research Test in Arithmetic last year but the teachers failed to find that the pupils did any better in their arithmetic work after the tests were given than they did before."

It is obvious that this superintendent did not realize that educational tests are not teaching devices but instruments which a teacher may use to secure accurate information concerning the results of her teaching and that whatever improvement in instruction may take place will come not from the mere giving of the tests but from the use of which is made of the results of the tests in the planning of future instruction.

The planning of instruction on the basis of scores secured from a test so as to correct the defects revealed and provide each pupil with that instruction which will enable him to make the most rapid growth of which he is capable is more complicated than simply applying special or general methods. It is first necessary to interpret the scores in terms of pupil needs, and this requires an understanding of both the test which was used and the nature of the mental processes involved in the subject. After the scores are interpreted the modification of instruction involves the application of general principles of method to particular cases. The position is now generally being taken by measurement men that the use of tests should always result in the improvement of instruction and that they must carry their work far enough so that the classroom teacher will know how to make use of the information which the test provides. Thus it becomes necessary that as an integral part of its work, a bureau of educational research should study the performances of pupils, particularly their errors, and give attention to collecting and devising methods of instruction which will correct these errors.

The carrying on of educational research along the lines which I just indicated, as well as in others, represents only one phase of the work of a bureau of educational research. Research in the field of education is valuable for its own sake and there will always be need for workers who are interested in contributing to the accumulation of human knowledge, but if there is not to be great waste there must also be those who contribute to the application of the results of research in the public schools. Therefore, it is vital that state bureaus should recognize that the stimulation of the application of the results of educational research in the public schools is one of their important functions. In fact, it is my judgment that for the immediate future, service to the public schools of the state should be made paramount in activities of state bureaus of educational research and that the research undertaken should be chosen with a view of increasing this service. This will not result in limiting the research activities for as I have indicated there are numerous vital problems which must be studied before we can render satisfactory service.

In bringing to your attention these "next steps" I have no intention of minimizing the use which has been made of educational tests in the past or any use which you may now be making. Some or all of these steps may not be new to some of you. Much progress has been made but the final goal has not yet been reached. No matter how creditable our past or present achievements may be, we must not be content to stop or even slacken in our efforts to achieve greater things. In the field of educational measurements this is not merely a commonplace generalization. As one reflects upon the development in this field during the past few years and upon the present activity it becomes clear that we have reached or are rapidly approaching a distinct mile-post. We are devising tests, standardizing them, interpreting the scores, and using the results in much the same way as we were three or four years ago. Our tests are not greatly different in kind and have not been improved except in relatively few instances. It, therefore, is pertinent to ask, What are the next steps?

I have outlined to you certain important next steps and urge you to consider them in connection with the basic question, What are the next steps? The evaluation of existing tests so that rational choices will be possible is primarily a research problem but it is one in which your bureau of educational research will need your coöperation. The refinement and extension of the interpretation will require a greater investment of time and energy in the study of scores and until a technique for doing it has been worked out, it will be difficult. But we should always bear in mind that only as we know what scores mean are we able to use them and that to attach a wrong meaning to them is disastrous. The value of educational tests is realized in the use that is made of the resulting scores. When the use of an educational test stops with the interpretation of the scores and there is no modification of instruction, the time and money invested is largely wasted. In order that the use of the test may be profitable, the scores must be interpreted in terms of pupil needs and instruction planned to meet these needs. And, finally, we must engender in teachers the realization that educational tests are instruments which may be used by them as well as by superintendents and principals, and that their primary function is to secure information which will be helpful in planning future instruction. I look forward to the day, and I do not believe it is very far in the future, when educational tests will be considered necessary items of schoolroom equipment just as we now consider charts, blackboards, reference books, supplementary readers, and the like necessary for the most effective instruction, and to know how to use educational tests wisely will be considered an essential factor in the teacher's professional preparation.

Educational Service in Iowa

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THE Bureau of Educational Service at the State University of Iowa has been organized almost five years. During this time it has been under the present director and followed a rather regular and somewhat uneventful career. There were no broken paths to follow at the time of organization and considerable time had to be spent in feeling the way and gradually learning the fields in which there were needs and opportunities to work. Being new to the state, the superintendents, principals, teachers, and school boards were not at all sure whether the new man and the new bureau could be trusted with the inside workings of their educational systems or not.

The earliest efforts were made in the field of child accounting and teachers' marks but the response revealed the fact, which perhaps should have been foreseen, that somewhat simpler forms of data must be gathered first. However, the data that were secured resulted in revealing some things very much worth while from the standpoint of the development of the work of the bureau.

1. It was found that in spite of the fact that the schools were reporting a very high percentage of attendance, seldom below 90 per cent and more often between 95 per cent and 100 per cent, that on the basis of fifteen school systems and over 13,000 children about 20 per cent were out more than 10 per cent of the time. Ten per cent were out more than 20 per cent of the time and 6.6 per cent were out more than 30 per cent of the time. And this was in a year in which we had no epidemic. These data, showing the superintendents an unexpected amount of absence, were valuable in two ways. They caused a much more searching attitude on the part of the better superintendents with respect to the whole question of absence. A number instituted a closer check on the cause of the absence and some very interesting results were thereby revealed. At least two men presented the data which they gathered in this connection before their Parent-Teacher's Associations which data showed conclusively that a very large portion of the absence could have been prevented by the exercise of ordinary care on the part of the home. The other result, which from the standpoint of the bureau was perhaps even more pleasing, was that it gave a decided impetus to the belief that the Bureau of Educational Service of the University was really a bureau of service and could assist superintendents in discovering things which it was worth their time to know.

2. The semester marks given by the teachers to these pupils were checked in terms of these absences and the evidence of a positive correla-

tion between absence and poor grades was most convincing. Contrary to general belief, however, absence seemed to be no more destructive to marks in the upper grades than in the lower. For example: 5.3 per cent of the children who had perfect attendance in the first grade received failing grades, and 30.2 per cent of the children who were absent more than 30 per cent of the time failed. In the fourth grade 6.5 per cent of the children having perfect attendance failed, while 27.8 per cent of the children who were absent more than 30 per cent of the time failed. In the seventh grade, 3.7 per cent of the children who had perfect attendance failed, and 25.4 per cent of the children who were absent more than 30 per cent of the time failed. The average for all grades showed 5 per cent of those having perfect attendance received failing grades, while 25.7 per cent of those who were absent more than 30 per cent of the time failed.

3. The distribution of teachers' marks showed just the type of thing that these investigations have always shown, namely, a very wide range of variation. But in some cases the revelation was a surprise to the superintendent and resulted in closer supervision of the pupils' grades. For example, one city gave grades of 95 per cent or above to 24.5 per cent of its pupils while another gave the same high grade to but .7 per cent of its pupils. The first city gave failing grades to 3.4 per cent of its pupils while the second gave failing grades to 18.6 per cent. The first superintendent wondered whether he had such very superior teaching as to warrant the high percentage of high grades while the second wondered whether the teaching in his system was poor or the standards of attainment expected were too high. A careful analysis of the situation resulted in some very desirable adjustment.

The bureau next took up the work of stimulating the use of standard tests and the state-wide survey of single problems. Arrangements were made for the bureau to be a distributing center for the various standard tests on the market. This work began in a small way and has been extended as the interest in the work has grown over the state. No special inducement was offered in any way to the superintendents to take up the work. The interest grew as increasing numbers of superintendents, principals, and teachers attended summer school and took courses in tests and measurements. In county institutes and at teachers' associations the value of such testing was demonstrated and in a few cases the director went into individual cities and supervised the giving of the tests.

While more or less testing has been done in this manner in more than 150 different cities and towns in the state, the results in some cases have not been as satisfactory as could be wished. Sometimes the teacher or superintendent, knowing only a little about the measurement movement, has sent in for a few tests, given them, computed the medians or averages, and considered the thing done. He has not realized that only the first step has been taken and that the value of the testing, if it is to have any real value, must come from an analysis of the results, a diagnosis of the causes lying back of these results, and the application of the proper measures to insure the highest type of result. Too often low results have been summarily dismissed with one of the following inferences: (1) The teacher is poor; I'll get another for her place next year. (2) What is needed is more time; we'll just spend more time on that subject and that will fix it. (3) Well, I don't think that test amounts to much. You can't measure education or the influence of a teacher like corn or hogs or lumber anyway. You know how fallacious such judgments are, but *we* have had some school people who have made them and acted upon them.

Because we have felt in Iowa that the measurement work has not accomplished all that it ought to accomplish, we are planning this coming year to extend to the schools doing testing a very definite offer to assist them in interpretation, diagnosis, and treatment. We shall not force this upon anyone. We shall make it clear that this type of service is open to them and that we are eager to be of greater assistance than ever before. We shall probably spend some time and energy in demonstrating the worth of this type of work in order to stimulate the requests for it.

State-wide work has been done in writing, Courtis arithmetic, and spelling. This work has been helpful in at least two respects: It has given to the superintendents of the state comparable data from other schools within their own state against which to check the status of their own system. We find that our superintendents would much rather check their own school results against results of neighboring schools, or against Iowa as a whole, than against standards which represent the entire United States. In neither of these subjects has the work gone to the extent to which it might be pushed. In all cases the only phase that has been taken up has been that of status. The question of method, of time, of experience and training of the teachers, of the extent of supervision and continuity of the administration have not been checked out carefully. Work in other subjects has been more or less fragmentary, but fall and spring testing under carefully controlled conditions will be attempted this coming year.

During the past two years another type of work has been growing very rapidly. In fact, this spring the calls could not be taken care of by the force available. This is in making surveys and giving advice to school boards relative to new buildings and grounds. Even during the war, some building was going on, but with the signing of the armistice a large number of communities which had been holding up any plans for the remodeling and enlargement of their school plant began to make preparation for this work. In consequence, a large number of calls have come in for this type of service. School boards want to know especially concerning the site, and the type of buildings to be built.

Where should a school building be built? There are many factors to be considered as you very well know. And yet I have been surprised again and again how often school board members have shown me by their statements that some of these factors have been left out of their consideration. That it should be located conveniently for the pupils to be accommodated is plain enough, but we must remember that buildings are not built just for today and the center of present school population is of less importance than the center of population as it will be during the major part of the next twenty or thirty years. I am thinking now of a high school building in one of our Iowa cities which is now an old building and must be replaced soon. It is very near the center of the present high school population. It is upon the site of the original high school building which the city erected nearly three-quarters of a century ago. Because of this fact, there is a very strong sentiment in the city that the new building must be erected on the same site, in spite of the fact that the city must grow almost entirely in one direction. An analysis of the registration of voters for the last twenty years, of the location of the cable lines put in by the telephone companies, and of the extensions of the water and gas lines all point to this one conclusion, that the city must make its growth in this one direction. I am glad to say that there is a growing tendency in our state for school boards to ask the bureau of educational service for assistance of this kind in analyzing their problems and in acting upon the recommendations after they are made.

Perhaps another illustration will make the matter even clearer: A few weeks ago the director was asked to visit one of our small cities, a place of about six thousand, to answer the question of type of building and site. The city was a rather typical agricultural center lying on a level plain. The possibilities of extending the city's growth were practically as good in one direction as in another. There were no hills or valleys or streams to interfere. Two railroads passed thru the city at almost right angles with each other. Two manufacturing plants were being solicited by the commercial club for establishment in the community. On the basis of a receptive attitude on the part of these industries, real estate men were endeavoring to impress upon the school board the necessity for building buildings in the additions in which these industries would locate, if . . . To complicate the matter somewhat further, the school board now owns a plot of ground within half a block of one of the railway stations, and on one of the main streets. Because a school building erected upon that lot would be passed by a majority of the people entering and leaving the city by rail, and because the street leads out on to one of the main traveled highways, the majority of people entering and leaving this city by auto would see the building, it was considered a highly desirable site since the building would advertise the city.

You will note that the items being considered were not at all items pertaining to the education of the children. Being in a purely advisory capacity I could not tell the school board that they must not erect their new building upon this site. The best I could do was to half humorously tell them, "I could not give my consent." The possibilities of their growth, and the present buildings which they have, pointed very specifically to one thing, viz: a junior high school building located rather centrally but away from the railroads and business districts. The arguments from the standpoint of the children arrived at this conclusion alone. The arguments from the standpoint of the adult population probably pointed in another direction. In reporting to the school board I made it my special point to insist that this proposal was in behalf of the children.

The second question, the type of building to be built, is more complex but also even more interesting. We have been working on the general principle that school communities should make provisions for as wide and comprehensive an education for their people as they are financially able to do. We are inclined to insist that this is the best possible investment that a community can make. We are quite sure that no child who is mentally capable of profiting by an elementary and secondary school education should be prevented from securing it either because of economic conditions in the home or because of the failure of the school to make the necessary provisions in its physical plant or curriculum or both. We said any child mentally capable, and we are quite sure that not nearly all those mentally capable have been remaining in our schools thru the elementary and secondary grades. In fact, when the curricula are sufficiently differentiated to include a very much larger number of kinds of work than has been offered in all too many schools in the past, the mentally incapable will have become far fewer than our present number of failures might incline us to believe.

In recommending for any community the type of building that should be built, the following factors are carefully considered: (1) the educational needs of the community as evidenced by the education of *all* its people; the vocational activities in the community; the vocational activities of the state and nation; the vocational desires of the children and young people of the community and the fundamental requisites in general education for democracy and Americanization; (2) the need for physical and social education by *all* the people and the extent to which other agencies are caring for this need, especially with the adult population; (3) the present school plant and its possibilities in the way of remodeling and utilization in the big program of education to be undertaken by the community; (4) the financial status of the community with the possibility of building all at once, a type of building which will accommodate this extensive program or the necessity for building a part and later adding as the finances of the community will permit.

I think a little time may well be spent in making more concrete some of the things considered under each of these factors. In undertaking to determine the type of building that should be built, the first consideration is certainly the educational needs of the community. A very careful survey of the present education of all the people in the community is quite necessary. We have all too long been considering that our school plant was for the education of children between the ages of six and fourteen, or six and twenty, and have failed to realize that the community should make provision for the further education of *all* its people who may desire to take advantage of such.

Some of our larger cities have been doing work in evening courses, especially in manual and domestic arts, commercial lines, and English for foreigners. These are well and good and should be made much more available than at present. There is no reason, however, why the English-speaking population who might desire it should not have an opportunity, as a part of the educational program of the community, to further their education in cultural lines as well as industrial. In fact, the rapid development of the educational status of any community is dependent upon the possibility of making an appeal to all the people rather than only to a small group.

In making a survey to determine the education of a community, specific questions have been asked concerning the education of the parents in terms of their completion or non-completion of elementary, secondary, collegiate, and professional schools, and in terms of the age of leaving and the educational status at time of leaving. When the object has been clearly made known and the way prepared, but little opposition has been experienced in securing this information.

This type of information is valuable not only from the standpoint of an enlarged educational program, especially in the nature of new buildings, but is also valuable frequently to the classroom teacher in working with the children. The educational status of the parents frequently furnishes an index to the educational opportunities such as high-class books and magazines which are provided in the home.

When 50 per cent of the parents of our high school children and a still larger per cent of the parents of the children in the grades (data from two cities only) left school at the age of sixteen or younger, and with a schooling of eighth grade or less, there should be developed in our public school system an opportunity for extension work which would enable a larger number of these people to secure additional educational advantages. As we stand at the present time, we have developed an attitude that when one becomes an adult his school days are over, except for those who go into the professional lines. We are definitely endeavoring to create a different attitude, viz: one which says that thruout life the doors of our public schools are open and provision will be made for extension work to care for any type of education which a group in the community may desire and the cost of which is not prohibitive. To be specific, classes in domestic science and art, in home nursing and allied fields, could with profit be run in the school as extension activities in even the comparatively small communities. That there is a need for such is not questioned. The only thing necessary is an adequate provision in the schools and the development of a sentiment in the community in favor of taking advantage of this sort of thing.

It is quite easy to ascertain the number and types of vocational activities in any community. In a sense it brings in the industrial survey, but it does more than that in that it secures much needed information regarding not only the different types of activities within the community and the number of people engaged therein, but in terms of the opportunities for advancement and the educational demands which the vocation makes.

Realizing, however, that only a comparatively small proportion of our people remain for a generation in a single community, the vocational activities of the state and nation must also be considered in planning the big program. Only large cities can provide specific vocational training for many industries within their borders, but comparatively small places can make provision in their educational program for acquainting their own people with many types of vocations and with the underlying principles which workers in these vocations need to know.

Our school curricula in cities of five to twenty-five thousand are pretty generally providing for three types of education. (1) They provide for the broad use of the tool subjects which are fundamental for all education and for daily communication and life activities. (2) Provision is made in the secondary schools for admission to college and this is well since a very respectable percentage of our high school pupils go to college. (3) The third line of education is in the commercial field. Practically all of our high schools now have a commercial course. It is unfortunately true, however, that the high school commercial department is caring for but a small portion of its legitimate field. It is making a strenuous endeavor to train bookkeepers, stenographers, and typists, but in a large percentage of cases has quite overlooked the fact that the biggest phase of the commercial field is selling. This phase of commercial work must be built up and provision must be made, not only in our course of study and in our teaching force, but in the building of our school plants of the future, to take care of this third activity in this department. It is hardly necessary to mention the fact that much more adequate provision for home-making and manual activities must be provided. Thus the vocational activities of the community, the vocational desires of the children, and the vocational possibilities of the state and nation must all be taken into consideration in the determination of the type of building.

Scarcely less important than the provision for a broad use of the tool subjects and even more important than the provision for vocational or pre-vocational education is the need for provision for physical and social education. We are just beginning to appreciate the need of these things. Even today many communities are not building their school buildings in such a way as to provide for physical education, nor appreciate the need for provision for social education. The demand for adequate auditorium facilities which will make possible the bringing together of different classes or of all the classes of the school into a common assembly, or for the bringing together of the youth and adults of the community as a social group, is just beginning to be recognized as it should be.

An athletic field of sufficient size is still almost a hopeless asking in our cities of above five thousand. The gymnasium is pretty well recognized, but largely for the use of the immediate school pupils alone. A recognition that the gymnasium should be an integral part of the provision for the needs of the adult, out-of-school population seems to be but vaguely understood. There is a great opportunity for the use of a gymnasium for adult groups in evenings, especially in the towns which do not have a Y.M.C.A. We are making a special effort to assist school boards in understanding this opportunity and consequently to plan for a school plant which will take care of this need.

In few communities is it either possible or desirable to scrap the present school plant and build entirely new. It is often much to be regretted that this is not possible, but the situation must be dealt with as it exists. Consequently, the existing plant must be considered from the standpoint of its utilization in the development of a big education program. Frequently a shift in organization makes possible a more advantageous use of the plant. Again, relatively inexpensive additions or changes within the building or group of buildings may make possible a much wider use than heretofore.

Finally, of course, the financial condition of the community must be given utmost consideration. It is not only useless but a positive detriment to present to a community plans which are wholly beyond attainment because of financial limitations. This work must be helpful, it must appeal to the school board and to the public as safe and sane, and while it must have large vision, it must at the same time be within the financial reach of the community.

This work has been discussed at so much length because it is a prominent type of our work at the present time. We are definitely cultivating this because we believe that it is an opportunity for the bureau to influence education in the right direction. There is always a tendency for the local boards to see only the local situation. Furthermore, there is always a tendency for them to see the local situation in the light of their own early educational history or experience, rather than in terms of a vision for the future. This reflects nothing upon the members of the board. They are busy men, devoting the major portion of their time to their own business affairs. It is not to be expected that they should all keep step with the most advanced things in the educational field. We believe that it is our special duty and privilege to assist them in gaining this big viewpoint and show them how they may develop it in their own local communities.

During the past two years another type of work has been greatly developed, viz: an appreciation on the part of the school boards and superintendents of an evaluation of the school system by a survey at the beginning of an administration. As the superintendents are learning more and more the nature of our survey work, they are appreciating the value of an inventory or evaluation of the educational status of the new system into which they are going. They welcome it at this time because they are not responsible for the conditions which exist. They appreciate the value of having detailed knowledge of conditions under which and with which they are to work. They realize, also, that this is a background against which any future progress may be placed as an evidence of their efficiency. Of course they appreciate, also, at least some of them do, that failure to produce may also show up against this same background. Most superintendents, however, are quite confident of their ability to secure results and therefore welcome concrete material which will show the starting-point from which they have progressed. School boards are appreciating that it is only just to the new man to give him every possible bit of knowledge which can be secured concerning their schools. They realize that this makes for higher attainments, for greater progress.

I believe the best evidence that the work of the Bureau of Educational Service is being appreciated in Iowa is the increased extent to which the superintendents are responding to the request for coöperation and to the growing number of requests from school boards for specific types of service. In general, the plan has been thruout the five years to extend a general invitation to all superintendents in the state in cities of five hundred and above, to contribute on all general problems which would be interesting in all sizes of cities. The requests have always been issued in the form of an invitation to coöperate in case the superintendent feels that the data gathered would be of use to him. Special emphasis is placed upon this point. We have endeavored to make the superintendents feel that the cordial relationship existing between them and the bureau would be maintained regardless of whether they contributed or not, and that the important consideration was for them to decide whether it was worth the time and energy necessary to secure the information.

During the first year not more than a 3 to 5 per cent response was secured from these invitations. During the last two years, response has been secured from more than 50 per cent. The last data called for secured a 50 per cent response in a week's time. During the first year but one request came from a school board for special service. During the present year, more requests have come in than it has been possible to care for. In fact, work is now dated which will cover a number of weeks during the coming year. This gives you a general indication of at least three types of work which the bureau has been endeavoring to do, and some idea of the reception which it is receiving from the school people of the state. It is presented here because we believe in the service and believe that you have a bureau here at the University which can do any of these types of work, as well as others which have not been mentioned, to the mutual advantage of the local community and of education in general.

Some Recent Developments in Spelling

ERNEST J. ASHBAUGH

PROBABLY no subject in the entire elementary school curriculum has received more attention during the last few years than spelling. Perhaps the chief reason for this is that it is unusually easy to check,—at least it appears so on the surface. Also the initial studies in measurement were made by Rice and Corman in this subject.

During this period of development, which has now extended over more than twenty years, the movement has followed three chief lines: (1) the selection of spelling lists; (2) the method of teaching and learning; (3) the development of scales and tests for measurement of status and progress.

Far more has been done in each of these lines than it will be possible to discuss during this period. I shall pass with briefest mention the earlier work in each line in order to confine myself mostly to the more recent developments.

Spelling books have been in use in our schools since the days of the famous Webster Blue Back, and during that time it has run the whole gamut of variation from books containing a very small list to books containing more than ten thousand words; from those which have no suggestions on the teaching or learning process to at least one boasting over six hundred separate suggestions.

The method of selecting the word lists has followed four general lines:

1. General English vocabulary such as is found in newspapers and literature. The Eldridge list is probably the best known of this type.
2. Those made from the misspellings of school children in their daily work. These have usually been combined with lists selected by teachers in the various grades as words which children in these particular grades need to know. Perhaps the Boston and Kansas City public school lists are the best known in this line.
3. The words which children use in written composition. The one well-known study in this line is that of W. Franklin Jones out of which he secured his famous one hundred "Demons".
4. The frequency of usage in adult correspondence has been chosen as representing the real needs outside the school. The studies of Anderson and Horn are most complete in this field.
5. Perhaps a fifth might be added, that is, the list arranged by Dr. Starch of the University of Wisconsin which attempts to cover the whole range of non-technical English words.

Some argument may be presented in behalf of each of these types of word lists. From the standpoint of the public school which takes all the children of all the people, it is believed that the fourth form, the standard of requirement in afterschool life, is the best. I do not mean to state that it is not desirable for children to learn to spell words which have but infrequent usage outside the schoolroom. I only maintain that the minimum list which every child should learn to spell to the point of automatic accuracy should be those words for which we have the best guarantee that the learner will have personal need during the years of life beyond the school age. For this reason, the major part of the discussion during this period will be based upon findings on words taken from correspondence.

Methods of Teaching and Learning. A considerable amount of experimentation has been conducted by psychologists and students in experimental education in endeavoring to find the most efficient method of teaching. Different methods of presentation, different time-intervals, and a multitude of devices have been originated and tried out with this purpose in mind.

Information has been secured from approximately one thousand teachers on the method used in teaching a spelling lesson. I have not found time to digest completely the material, but a somewhat cursory examination of the data indicates that there is truly a multitude of different ways in vogue.

The one thing that stands out clearest is that every child in the entire class is expected to learn each word in the assigned lesson by means of a particular teaching method or device. Experimentation has quite clearly demonstrated that a considerable proportion of the children in a class already know the spelling of from 10 to 75 per cent of the words in a given spelling lesson before the teaching process begins. Certainly we cannot defend the practice of requiring all the children to go thru the mechanics of learning that which they already know. If the lesson is assigned for silent learning without teaching, the children will certainly not devote the scheduled amount of time to the lesson before them. Why should they? If they are under a disciplinarian who insists that each child in the class shall be studying a particular book and lesson at a particular time, the deadening influence can be easily imagined.

If the lesson is taught by the teacher to the class, that is, if all the class goes thru the work in concert, which seems to be the prevailing custom, then the children are all participating, but some are participating in that which does not contain new, enlightening material and in which mental growth does not take place. Consequently, it seems that in spelling we should first test over the matter in hand and then have each child work upon the words which he himself missed. The possible detriment due to writing an incorrect form is more than overcome by the crystallization of motive in recognition of the specific task to be done and the specific goal to be attained. Experimental evidence thoroly supports this view.

I might say parenthetically that the same thing holds true in other subjects than spelling. One of the most enlightening procedures which I have known to be conducted in a public school system for a long time occurred in a school in which the supervising principal at the beginning of each six-weeks' period had the teachers give to the pupils an examination covering the points which they would be expected to know at the end of this period. The amount of material which was already known, and consequently did not need to be taught, was surprising. Much of it was known well, not only by a few bright ones in the class but by every member of the class.

On the basis of rather elaborate experimentation it seems that the important thing is not method of teaching but method of learning. What is needed is not a precise method of teaching lesson after lesson, but a clear, definite, usable method of learning on the part of the pupils. This method of attacking the learning of a word; of self checking, in order to know when it has been learned, is the most valuable thing which we can give our children. This has been quite thoroly worked out, at least a method of learning has been devised which gives very satisfactory results. The following will make clear the evidence that the method works:

RECORD OF TESTS

	A	*B*	*C*	*D*	*1*	*2*	*3*	*4*
condition				|	1	0	0	0
opinion	|	/		|	6	3	2	0
certain		/			1	2	1	0
piece	|		|		6	8	0	0
circular		\		+	9	5	2	2
organize	|			|	4	1	2	3
associate	—	|	—	|	10	6	2	0
business	+		|	|	11	6	2	1
first	20	7	3	22	202			
second	11	1	1	4		123		
third	3	3	0	0			48	
fourth	1	2	0	0				24

In this chart A, B, C, and D represent different individuals in the class. 1, 2, 3, and 4 on the same line indicate the different tests over the material. But 8 words out of the 50 that were given the class to learn are shown on the chart. The figures under the numbers of the test opposite each word show the number of children in the class who misspelled the word on the test numbered at the top, while the numbers at the bottom of the chart after the words "first", "second", "third", and "fourth" respectively, show the number of words missed by the child indicated by the letter above. The totals given in the diagonal show the total number of words missed by all the children on each of the four tests.

The symbols opposite each word for the various individuals A, B, C, and D are interpreted as follows: A vertical line (|) means that the word was missed on the first test; a horizontal (—) that it was missed on the second test; oblique to the left (/) that it was missed on the third test; and oblique to the right (\ ) that it was missed on the fourth test. The uniting of any two of these symbols would indicate that this individual missed this particular word on the tests indicated by the symbols.

The chart is read thus: The word "condition" was missed on the first test by pupil "D", the vertical line showing that it was Test No. 1. Also the 1 in column for Test 1 shows that but one child missed this word on the first test and no child missed it on the succeeding tests. The word "opinion" was missed on the first test by child "A", as shown by the vertical line; it was missed on the third test by child "B", as is shown by the oblique to the left; and it was also missed on the first test by child "D", as is shown by the vertical symbol. The rest of the chart is interpreted in the same way. The totals show that 6 children missed it on the first test, 3 on the second, 2 on the third, and no one on the fourth.

It will be noted that the word "circular" was missed by child "D" on both the first and second tests as indicated by the vertical and horizontal symbols.

Dropping down to the bottom of the table you will note that child "A" missed 20 words on the first test, 11 on the second, 3 on the third, and 1 on the fourth. That is, he cleaned up 19 of the 20 words which he did not know.

Child "D" missed 22 on the first test, 4 on the second, and none on the third and fourth. The total sums show that 202 words out of the total possible number (50 words multiplied by 19, the number of pupils in the class), were missed on the first test; 123 were missed on the second; 48 on the third, and 24 on the fourth. That is, the class had cleaned up their spelling work from an average of almost 11 words missed per pupil to an average of 1.3 per pupil.

Measuring Spelling Results. The desire to be able to measure accurately the results of experimentation and the status and progress of the pupils in school has been responsible for the development of standardized tests and scales. Naturally, spelling was one of the early subjects in which this type of work was done. The Buckingham Scale which appeared in 1913, and the Ayres Scale in 1915, with the various tests which have been built, especially upon the latter, evidence the activity in this line.

The Ayres Scale has been of immense service to the schools of the country. It has focused attention upon a small list of very common words and has given, in a general way, an easy method of comparison of local results with general school results in the cities of the United States. Judged by this scale, progress from grade to grade is a very regular matter in the subject of spelling and the learning of words is a very uniform process. The naïve user of the scale, observing that words in column "J", for example, are listed as 66 per cent words for Grade II, 84 per cent words for Grade III, 94 per cent words for Grade IV, 98 per cent words for Grade V, and 100 per cent words for Grade VI, expects each word within that column to behave in just this manner. Experimentally it is discovered that they do not; that on the basis of averages for these words with a large number of children, these results are approximately correct, but individual words within this column may have varied somewhat widely. The following table shows this very clearly:

GRADE	II	III	IV	V	VI
south	36	65	96	98	98
game	56	75	91	99	98
age	68	86	95	99	100
band	62	77	91	91	97
glad	64	75	84	96	97
think	73	90	98	99	99
bill	62	73	95	98	100
gold	77	90	96	98	100
cannot	75	88	94	95	98
wind	74	82	97	95	97
girl	73	78	91	95	99
May	72	81	99	99	99
Average	66	80	94	97	98½
Ayres' Standard	66	84	94	98	100
Ayres' Variation	63–69	82–86	94–95	98	100
Variation above	36–77	65–90	84–98	91–99	97–100

This table shows the results of 200 children in each grade, the children being chosen at random from 25 to 40 Iowa cities. It is to be read in this manner: The word "south", children in Grade II spelled with 36 per cent accuracy; Grade III, 65 per cent; Grade IV, 96 per cent, Grade V, 98 per cent; and Grade VI, 98 per cent. The word "game", children in Grade II spelled with 56 per cent accuracy; Grade III, 75 per cent; Grade IV, 91 per cent, etc. The figures for the other words are read in the same manner.

These words were not chosen to present the most extreme variation. I am quite sure that I can find in my data words which appear in column "J" of the Ayres Scale which second-grade children spelled with a lower accuracy than 36, and other words which they spelled with a higher accuracy than 73. I selected as many as I thought could be well shown on a single chart showing some variation away from 66 per cent, but still averaging 66 per cent for Grade II children. The percentages for the other grades follow in order wholly without any thought concerning their selection.

You will note that the average in Grade II for these words as found in my data and on the Ayres Standard is identical. They were so chosen. In the other grades there is not very much variation. On the basis of the scale the third grade with 80 per cent is 2 per cent below the lower variation which Ayres included in his 84 per cent step, the ranges for these steps being shown as the "Ayres variation". By this is meant that in the making of his scale all accuracies of from 63 per cent to 69 per cent were included together as 66 per cent. Accuracies 82 per cent to 86 per cent inclusive were included as 84 per cent. In the last three steps of the scale but a single per cent is included, 98 per cent, 99 per cent, and 100 per cent each being a separate step. Thus the average for the fifth grade is one step low and for the sixth grade is 1½ steps. This is a situation which is found with a high degree of regularity, viz: that when the expectancy as per grade-steps falls in the extreme upper range, the tendency is for the actual results to fall short. Otis found this same fact true, which he reported in *School and Society,* Vol. IV, in 1916.

More significant, however, than these slight variations in average are the variations in the individual words. While the average for even this small number of words brings the result very close to the results which Ayres places in his scale, the actual variation for individual words is much wider. This extreme is shown by the lowest figures on the table. "South" and "gold" both appear in the Ayres list, column "J", and the data which I have collected show that second-grade children spell "gold" more than twice as accurately as "south", and third-grade children more than 25 per cent better. This variation is shown in another way on the following charts. These charts show by steps the progress which one might expect from the position of the words in the Ayres scale and the actual progress which is shown by this study. (Charts not included.)

It will be noted that some of the words follow the expectancy quite closely while others differ considerably from it. This can be shown much more clearly on some other words than these under discussion. This fact presents a very interesting situation in the whole spelling problem. Some words seem to present great difficulty for children in two or more consecutive grades and then are suddenly learned to a rather high percentage of accuracy. Other words are learned to a rather high degree of perfection in the first two or three grades but continue to cause about so much trouble for the children in the various grades thereafter. The following illustrates this very clearly:

GRADE	II	III	IV	V	VI	VII	VIII
above	18	52	84	94	97	99	100
ache	8	13	37	65	83	85	88
aid	21	27	54	69	80	92	98
also	35	63	85	94	96	99	99
April	18	61	83	92	92	98	99
basket	28	57	88	92	97	97	98
bottle	16	49	74	89	96	98	100
branch	26	53	75	91	97	98	98
brought	28	54	85	90	94	96	98
butter	45	80	97	97	99	99	100
city	51	72	96	97	99	98	100
collect	6	8	29	64	84	93	96
colored	21	28	65	66	79	84	89
comply	15	37	60	79	85	88	88
exception	1	8	28	49	72	78	86
else	17	30	52	76	86	94	98
carrying	27	33	44	53	70	70	86
cross	37	60	80	94	98	99	100
rule	17	48	74	93	95	100	100
face	45	78	95	96	99	99	100
drop	48	69	88	92	97	99	99
lady	45	68	92	94	98	99	99
corner	44	61	70	80	90	92	95

The conclusion in this matter seems to me to be perfectly clear, namely, that when testing children with words from a column in a scale, it is necessary to recognize the following facts:

1. That the average for a large number of children, even upon a relatively small number of words, will approximate closely a satisfactory measure of the situation.
2. The larger the number of children that one is measuring, the smaller the number of words one may use and secure the same degree of accuracy.
3. In measuring as small a group as a class it is probably necessary to use as many as 50 words, and greater accuracy will be secured by using 100 or more.
4. Individual children on any group of words, and individual words with any size group of children, are likely to vary far from a stated norm.

Another development that has been receiving considerable attention in recent years is the question of trouble spots, places of special difficulty, in a word. Many people have assumed and frequently stated that every word has its particular place of difficulty. On this assumption it has been concluded that if only this trouble spot for each word were ascertained the whole difficulty of teaching spelling would be eliminated. Further, it has been assumed that these trouble spots will classify into a few types so that by having our attention called to a few types of prevalent error we may guard ourselves against misspelling of all words. Experimentation has not revealed such a situation. Experimentation has revealed that Jones' "100 Demons" are not the 100 demons for all children or for children in successive grades. Jones mixed together his findings in all the grades and thereby covered up some significant facts.

Furthermore, a checking of the spelling errors on a random selection of words has shown rather conclusively that many words do not exhibit clearly a specific type of error, while others do. Further, that the specific point of difficulty upon some of these words which tend to show such, changes from grade to grade. The following words will illustrate some of these findings, and should be read as follows:

Out of 200 attempts the fourth-grade children missed the word "extreme" 170 times, misspelling it in 59 different ways. The sixth-grade children missed the word 107 times in 29 different ways, and the eighth-grade children missed it 44 times in 10 different ways. The most frequent form of misspelling was "extream" which form occurred 43 times in fourth grade, 44 times in sixth grade, and 20 times in eighth. The next form "exstream" occurred 34 times in fourth, 10 times in sixth, and 1 time in eighth. "Extreem" occurred 7 times in fourth, 13 in sixth, and 11 in eighth. The other illustrative words which I shall give are all read in the same way. It is to be remembered that in each grade there were 200 children and that the numerator of the fraction gives the total number of times the word was misspelled and the denominator the total number of different ways of misspelling.

GRADE	IV	VI	VIII		IV	VI	VIII
extreme	170	107	44	extream	43	44	20
	59	29	10	exstream	34	10	1
				extreem	7	13	11

This word tends to show two types of errors in each grade, but while one type persists thru the grade, the misspelling which stands second in frequency in the fourth grade almost entirely disappears in the eighth.

The word "forenoon" is perhaps as good an illustration of a word with specific difficulty as I have been able to find.

GRADE	IV	VI	VIII		IV	VI	VIII
forenoon	118	68	39	fornoon	76	62	35
	27	6	5	fournoon	5	2	1

With 76 of the 118 errors in the fourth grade, 62 of the 68 in the sixth grade, and 35 of the 39 in the eighth grade, the omission of the "e" is certainly characteristic of the misspellings of the word.

On the other hand, the word "picture" presents a different situation:

GRADE	IV	VI	VIII		IV	VI	VIII
picture	55	14	3	pitcher	6	2	1
	34	11	3	pitchure	6	1	1
				pitcure	5	1	1
				piture	3	3	0

Out of 55 misspellings in the fourth grade, there were but six occurrences of a single type. Of 14 misspellings in the sixth grade, there were but 3 of a single type, and this was not the type which had 6 occurrences in the fourth grade. The word was misspelled but three times in the eighth grade but in three different ways.

The question may well be raised as to whether the type of error is of sufficient importance to be specifically pointed out if its frequency of occurrence among the total number of misspellings by 200 children represents less than 50 per cent or often less than 25 per cent of the total number.

"Publication" presents another good illustration of the diversified possibilities.

GRADE	IV	VI	VIII		IV	VI	VIII
publication	137	57	21	puplication	4	5	2
	126	48	19	publycation	4	1	0

Certainly there is no place in that word upon which one may put his finger and say "This is the trouble spot in learning to spell this word."

What shall we say about the word "recommend"?

GRADE	IV	VI	VIII		IV	VI	VIII
recommend	187	154	89	recomend	25	70	39
	109	44	11	recamend	12	9	3
				reccomend	5	16	30

Numerous other illustrations might be cited.

There are certainly some words which are not homonyms which yet sound so nearly like other words that they are frequently misspelled in spelling lessons.

The most prevalent way of misspelling "weigh" in the sixth and eighth grades was "weight". This occurred in more than 50 per cent of the total misspellings.

Many other illustrations of this type could be given. I think probably one would be doing a very distinct service in spelling, at least for those who teach by the usual method, if these words which children frequently confuse were to be carefully identified so that teachers would consciously make a special effort to pronounce these words distinctly.

Perhaps no particular type of word has received more attention from this standpoint than the ei-ie words. The most elaborate experiment conducted to ascertain the value of a rule in the learning of spelling was conducted by a University of Iowa student on this particular point. The data were gathered by means of a very carefully controlled teaching experiment on over three thousand children in three cities. The results showed that while the rule is more effective than drill, in improving the spelling of words not taught but governed by the rule, drill was more effective in correcting inversion errors; did not result in causing inversion errors, and was more effective in spelling words not governed by the rule and in securing permanent results.

Less elaborate experiments with other rules have tended to verify the same conclusion.

The recent developments in the field of spelling may be summarized, therefore, about as follows:

1. The consensus of opinion tends toward a list of words of greatest frequency in adult correspondence as the minimum list which all children in the elementary grades should learn to spell to a point of automatic accuracy. Other words of high social usage, or of great importance in school work, may be added as supplementary to this minimum requirement.
2. Since almost any list of words appropriate for a given grade contains words whose spelling is already known by a portion of the children in the grade, a preliminary testing should be given in order that time shall not be wasted in teaching children words which they already know.
3. It is more important to give a child a definite usable method of learning, a tool which he may use in attacking his own individual problems, than in developing a high technique of teaching on the part of the teacher.
4. In measuring results of spelling, standardized tests and scales are of very great value. It must be remembered, however, that the standards on these tests and scales are mass results, and consequently, if a small list of words is to be used, a large number of children must be considered and vice versa, in order to have reliable results. Even then, it must be recognized that individual words and individual pupils may be expected to vary widely from a standard.

5. Trouble spots, the particular points of difficulty in words, occur in some words and do not occur in others. Further, the particular type of difficulty which seems prominent in one grade occasionally disappears and another form of misspelling becomes prominent. For this reason it is doubtful if it is worth while to spend much time in calling attention to trouble spots.

6. The advisability of teaching spelling rules has not been approved by the results of experimentation.

The points discussed in this paper, as well as many others, are discussed in Part 2 of the Eighteenth *Yearbook* of the National Society for the Study of Education. It was thought worth while, however, to present to you at this time experimental data on several of the points under discussion.

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